

User Manual netANALYZER

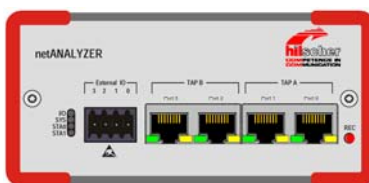
netANALYZER Card PCI RTE - NANL-C500-RE
netANALYZER portable Device PCIe RTE - NANL-B500E-RE
netANALYZER portable Device RTE - NANL-B500G-RE
netANALYZER Software V1.5.x.x



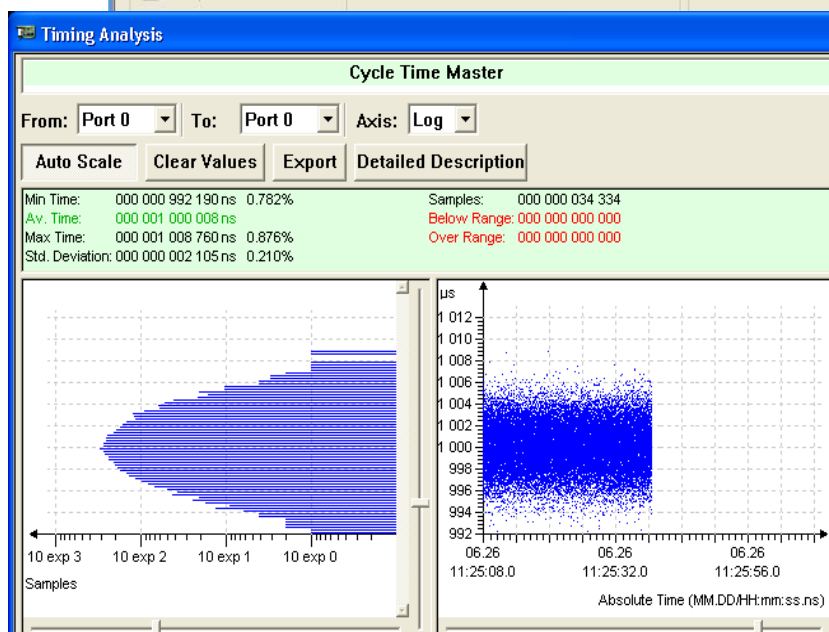
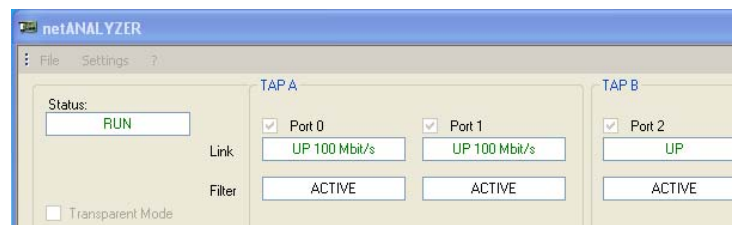
NANL-C500-RE



NANL-B500E-RE



NANL-B500G-RE



Installation, Operation and Hardware Description

Hilscher Gesellschaft für Systemautomation mbH

www.hilscher.com

DOC091110UM14EN | Revision 14 | English | 2014-05 | Released | Public

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1 Introduction

1.1 About the User Manual

This user manual contains descriptions about the installation and the use of the

- **netANALYZER Software** (graphical user interface)

and about the installation, the operation and hardware of the netANALYZER devices

- **netANALYZER PC Card with PCI Interface** for Real-Time Ethernet and all 100BASE-T Ethernet Networks
- **NANL-C500-RE** and
- **netANALYZER portable Device with ExpressCard Interface** for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks
- **NANL-B500E-RE** (Stand-alone Device),
- **netANALYZER portable Device with Gigabit Ethernet PC Interface** for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks
- **NANL-B500G-RE** (Stand-alone Device).

1.1.1 List of Revisions

Index	Date	Hard / Software	Chapter	Revisions
13	13-10-29	netANALYZER Rev. 1.5.x.x, NANL-C500-RE Rev. 4, NANL-B500E-RE Rev. 3, NANL-B500G-RE Rev. 3	All	Revised. netANALYZER portable Device RTE Gigabit NANL-B500G-RE added, Windows® 8 added.
14	14-05-05	netANALYZER Rev. 1.5.x.x, NANL-C500-RE Rev. 4, NANL-B500E-RE Rev. 3, NANL-B500G-RE Rev. 4	1.1.2, 1.2, 2.5.6, 4.1, 4.3, 7.2.6, 4.4, 6.2.5, 6.3, 7.8, 13	Section <i>Note on Hardware, Firmware, Driver and Software Versions</i>: - NANL-B500G-RE: hardware revision 4 added, - Change of names for „netANALYZER Remote Access Windows Client.exe“, „netANALYZER - netSCOPE Driver x86.ms“ und „netANALYZER - netSCOPE Driver x64.ms“. - Information about NANL-B500G-RE firmware update added, - Name of the firmware file NANL-500.nxf updated. Section <i>Contents of the Product DVD</i> information about NANL-B500G-RE firmware update added. Sections - <i>Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)</i>, - <i>Notes for Installation and Operation</i>, - <i>Overview Software and Hardware Installation</i>, - <i>Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)</i>: Warnings added concerning the assignment of incorrect IP addresses or malfunction if NANL-B500G-RE is connected incorrectly. Section <i>Overview how to update Hardware, Software and Driver</i>: Description for firmware update of the NANL-B500G-RE added. Section <i>Installation Ethernet Device Configuration (only NANL-B500G-RE)</i> updated. Section <i>Configuration of the IP Address (only NANL-B500G-RE)</i> requirements added. Section <i>How to update the NANL-B500G-RE Firmware</i> added. Adaption of Terminology: „netANALYZER Driver -> „netANALYZER / netSCOPE Device Driver“, „netANALYZER Marschaller“ -> „Remote Acces windows Client“. Chapter <i>Technical Data</i> revised.

Table 1: List of Revisions

Updates of **this** document and updates of firmware files are available via the Hilscher homepage: http://www.hilscher.com/support_downloads.html.

1.1.2 Note on Hardware, Firmware, Driver and Software Versions



Note: The listed revisions of the netANALYZER devices and the versions of the required driver and software functionally belong together.

Device Name	Device Type	Part No.	Revision
netANALYZER PC Card with PCI Interface for Real-Time Ethernet and all 100BASE-T Ethernet Networks * Note: If you have already installed the netANALYZER card of the hardware revision 2 or 3 in your PC, you must apply the netANALYZER hardware update and then update the driver and the software.	NXANL 500-RE	7.310.100	2*
	NXANL 500-RE	7.310.100	3*
	NANL-C500-RE	7.310.100	4
netANALYZER portable Device with ExpressCard Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks	NANL-B500E-RE	7.311.100	1
	NANL-B500E-RE	7.311.100	2
	NANL-B500E-RE	7.311.100	3
netANALYZER portable Device with Gigabit Ethernet PC Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks Note: The analyzer device NANL-B500G-RE is only supported by the netANALYZER software beginning from version 1.5.x.x.	NANL-B500G-RE	7.313.100	3
	NANL-B500G-RE	7.313.100	4

Name	File Name	Version	Path on the DVD
netANALYZER Hardware Update	netANALYZER_hw_update.iso	-	Update NXANL 500-RE Revision 3

Table 2: netANALYZER Hardware

Name			File Name	Version	Path on the DVD
Hilscher netANALYZER Setup			netAnalyzer.msi	1.5.x.x	Software
Ethernet Device Configuration Tool			EnDevConfigTool.msi	1.7.x.x	
Remote Access Client (only for Analyzer Device NANL-B500G-RE)			netANALYZER Remote Access Windows Client.exe	1.5.x.x	Driver
netANALYZER / netSCOPE Device Driver	Windows® XP, Windows® Vista, Windows® 7, Windows® 8	32-Bit	netANALYZER - netSCOPE Driver x86.msi	1.5.x.x	Driver\MSI
		64-Bit	netANALYZER - netSCOPE Driver x64.msi		
netANALYZER Wireshark Plugin <i>(not required for Wireshark 1.7.1 and newer)</i>	Hilscher netANALYZER Wireshark Plugin Setup		WiresharkPlugin.msi	1.0.2.0	Plugin
	Windows® XP, Windows® Vista, Windows® 7, Windows® 8	32-Bit	netanalyzer.dll		
		64-Bit	netanalyzer_x64.dll		
NANL-B500G-RE firmware update			nanl-b500g-re.update	1.0.4.0	NANL-B500G-RE firmware update\image V1.0.4.0

Table 3: Setup Files for Software Driver and Plugin on the DVD

Name	File Name	Version	Path
netANALYZER Software (Windows-Application)	netANALYZER.exe	1.5.x.x	C:\Program Files\Hilscher GmbH\ netANALYZER
netANALYZER Firmware	NANL-500.nxf	1.5.x.x	C:\Program Files\ netANALYZER Device Driver\...
netANALYZER / netSCOPE Device Driver	netANADrv.SYS	1.5.x.x	
netANALYZER Toolkit			

Table 4: Installed netANALYZER Files (Software Application, Firmware, Driver, Toolkit)

1.1.3 Conventions in this Manual

Notes, operation instructions and results of operation steps are marked as follows:

Notes



Important: <important note you must follow to avoid malfunction>



Note: <general note>



<note, where to find further information>

Operation Instructions

1. <instruction>

2. <instruction>

or

➤ <instruction>

Results

↪ <result>

Safety Messages

The labeling of safety messages is explained in the chapter *Safety*.

1.2 Contents of the Product DVD

The netANALYZER Installation DVD for the analyzer card NANL-C500-RE and for the analyzer device NANL-B500E-RE or NANL-B500G-RE contains:

- The netANALYZER setup file
- The netANALYZER / netSCOPE Device Driver setup file for 32-bit and for 64-bit
- Firmware update file for Analyzer Device NANL-B500G-RE
- The Wireshark netANALYZER Plugin file for 32-bit and for 64-bit (*not required for Wireshark 1.7.1 and newer*)
- The documentation (netANALYZER User and Driver Manual)
- 2 Examples for the netANALYZER Application Programming Interface (API)

1.2.1 Directory Structure of the DVD

Directory Name	Description
Root Directory	Flash Animation (<i>netAnalyzer.exe</i>)
Documentation	Documentation in the Acrobat® Reader Format (PDF), Adobe Flash Player installation program
Driver	netANALYZER / netSCOPE Device Driver for Windows® XP, Windows® Vista, Windows® 7, Windows® 8 Remote Access Client (only for Analyzer Device NANL-B500G-RE)
Examples	2 Programming examples for the Application Programming Interface (API) for the analyzer card NANL-C500-RE and for the analyzer device NANL-B500E-RE or NANL-B500G-RE
fscommand	Help files for the installation program.
NANL-B500G-RE firmware update	Firmware update file for Analyzer Device NANL-B500G-RE
Plugin	Wireshark netANALYZER Plugin files
Setup	Installer to install the single components (<i>setup.exe</i>)
Software	netANALYZER Setup (<i>netAnalyzer.msi</i>) Ethernet Device Configuration (<i>EnDevConfigTool.msi</i>)
Update NXANL 500-RE Revision 3	netANALYZER hardware update for the NXANL 500-RE-hardware-revisions 2 and 3

Table 5: Directory Structure of the DVD

1.2.2 Documentations netANALYZER

The following documentation overview gives information, for which items you can find further information in which manual.

Manual	Contents	Document name
<i>Available on the netANALYZER DVD</i>		
User Manual netANALYZER (this document)	Installation, Operation and Hardware Description	netANALYZER UM XX EN.pdf
Driver Manual netANALYZER API, Windows XP/Vista/7/8, V1.x	Description of the netANALYZER API	netANALYZER API Windows DRV XX EN.pdf
Ethernet Device Configuration, Address Setting for Ethernet capable Hilscher Devices	Operating Instruction Manual	Ethernet Device Configuration OI XX EN.pdf
What's New netANALYZER, netANALYZER DVD	Revision List	What's New netANALYZER DVD RL XX EN.pdf
<i>Available on the Real-Time-Ethernet-Kit DVD, refer to www.hilscher.com</i>		
User manual Real-Time-Ethernet Kit	Analysis Examples	Real-Time-Ethernet-Kit Analysis Examples UM XX EN.doc

Table 6: Documentations netANALYZER



These documents are available on the DVD delivered with the device underneath the directory **Documentation**, in Adobe Acrobat® Reader format (PDF) or you can download the latest edition of a manual from the website www.hilscher.com under **Support > Downloads > Manuals** or under **Products** directly with the information about your product.

1.2.3 What's New



All current version information for hardware and software described in this manual are provided in the folder *\Documentation\ What's New netANALYZER DVD RL XX EN.pdf* on the netANALYZER DVD.

1.3 Legal Notes

1.3.1 Copyright

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1.3.2 Important Notes

The user manual, accompanying texts and the documentation were created for the use of the products by qualified experts, however, errors cannot be ruled out. For this reason, no guarantee can be made and neither juristic responsibility for erroneous information nor any liability can be assumed. Descriptions, accompanying texts and documentation included in the user manual do not present a guarantee nor any information about proper use as stipulated in the contract or a warranted feature. It cannot be ruled out that the user manual, the accompanying texts and the documentation do not correspond exactly to the described features, standards or other data of the delivered product. No warranty or guarantee regarding the correctness or accuracy of the information is assumed.

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Hilscher Gesellschaft für Systemautomation mbH is not liable under any circumstances for direct, indirect, incidental or follow-on damage or loss of earnings resulting from the use of the information contained in this publication.

1.3.3 Exclusion of Liability

The software was produced and tested with utmost care by Hilscher Gesellschaft für Systemautomation mbH and is made available as is. No warranty can be assumed for the performance and flawlessness of the software for all usage conditions and cases and for the results produced when utilized by the user. Liability for any damages that may result from the use of the hardware or software or related documents, is limited to cases of intent or grossly negligent violation of significant contractual obligations. Indemnity claims for the violation of significant contractual obligations are limited to damages that are foreseeable and typical for this type of contract.

It is strictly prohibited to use the software in the following areas:

- for military purposes or in weapon systems;
- for the design, construction, maintenance or operation of nuclear facilities;
- in air traffic control systems, air traffic or air traffic communication systems;
- in life support systems;
- in systems in which failures in the software could lead to personal injury or injuries leading to death.

We inform you that the software was not developed for use in dangerous environments requiring fail-proof control mechanisms. Use of the software in such an environment occurs at your own risk. No liability is assumed for damages or losses due to unauthorized use.

1.3.4 Warranty

Although the hardware and software was developed with utmost care and tested intensively, Hilscher Gesellschaft für Systemautomation mbH does not guarantee its suitability for any purpose not confirmed in writing. It cannot be guaranteed that the hardware and software will meet your requirements, that the use of the software operates without interruption and that the software is free of errors. No guarantee is made regarding infringements, violations of patents, rights of ownership or the freedom from interference by third parties. No additional guarantees or assurances are made regarding marketability, freedom of defect of title, integration or usability for certain purposes unless they are required in accordance with the law and cannot be limited. Warranty claims are limited to the right to claim rectification.

1.3.5 Export Regulations

The delivered product (including the technical data) is subject to export or import laws as well as the associated regulations of different countries, in particular those of Germany and the USA. The software may not be exported to countries where this is prohibited by the United States Export Administration Act and its additional provisions. You are obligated to comply with the regulations at your personal responsibility. We wish to inform you that you may require permission from state authorities to export, re-export or import the product.

1.3.6 Registered Trademarks

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Wireshark® and the "fin" logo are a registered trademark of Gerald Combs.

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All other mentioned trademarks are property of their respective legal owners.

1.3.7 Obligation to read and understand the Manual



Important!

- To avoid personal injury and to avoid property damage to your system or to your device, you must read and understand all instructions in the manual and all accompanying texts to your PC card, before installing and operating your device.
 - First read the **Safety Instructions** in the *Safety* chapter.
 - Obey to all **Safety Messages** in the manual.
 - Keep the product DVD providing the product manuals.
-

1.3.8 Hilscher Software License Agreement

When you install the Hilscher software you are asked to read the Hilscher Software License Agreement and explain your acceptance to it.

2 Safety

2.1 General Note

The documentation in the form of a user manual, an operating instruction manual or other manual types, as well as the accompanying texts have been created for the use of the products by educated personnel. When using the products, all Safety Messages, Safety Messages, Property Damage Messages and all valid legal regulations have to be obeyed. Technical knowledge is presumed. The user has to assure that all legal regulations are obeyed.

2.2 Intended Use

The netANALYZER devices described in this User Manual each work as a passive Ethernet analyzer in RT-Ethernet systems. The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE analyze the data in a communication link and capture the incoming Ethernet frames.

Device Name	Device Type
netANALYZER PC Card with PCI interface for Real-Time Ethernet and all 100BASE-T Ethernet networks	NANL-C500-RE
netANALYZER portable Device with ExpressCard interface for Real-Time Ethernet and all 10/100BASE-T Ethernet networks	NANL-B500E-RE
netANALYZER portable Device with Gigabit Ethernet PC interface for Real-Time Ethernet and all 10/100BASE-T Ethernet networks	NANL-B500G-RE

Table 7: netANALYZER Devices

If the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE are used outside of the scope described in this user manual respectively in the other netANALYZER documentations, an error free function can not be guaranteed.

2.3 Personnel Qualification

The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE must only be installed, configured and removed by qualified personnel. Job-specific technical skills for people professionally working with electricity must be present concerning the following topics:

- Safety and health at work
- Mounting and connecting of electrical equipment
- Measurement and Analysis of electrical functions and systems
- Evaluation of the safety of electrical systems and equipment
- Installing and Configuring IT systems

2.4 Safety Instructions to avoid Personal Injury

To ensure your own personal safety and to avoid personal injury, you necessarily must read, understand and follow the following safety instructions and safety messages in this manual about danger causing personal injury, before you install and operate your device.

2.4.1 Electrical Shock Hazard (NANL-C500-RE)

Only NANL-C500-RE:

The danger of a lethal electrical shock caused by parts with more than 50V may occur if you open the PC cabinet to install the NANL-C500-RE card.

- **HAZARDOUS VOLTAGE** is present inside of the PC or of the connecting device, into which the NANL-C500-RE card is integrated. Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the NANL-C500-RE card only after disconnecting power.

An electrical shock is the result of a current flowing through the human body. The resulting effect depends on the intensity and duration of the current and on its path through the body. Currents in the range of approximately ½ mA can cause effects in persons with good health, and indirectly cause injuries resulting from startle responses. Higher currents can cause more direct effects, such as burns, muscle spasms, or ventricular fibrillation.

In dry conditions permanent voltages up to approximately 42.4 V peak or 60 V DC are not considered as dangerous if the contact area is equivalent to the size of a human hand.

Reference Safety [S2]

2.5 Safety Instructions to avoid Property Damage

To avoid property damage respectively device destruction to the device and to your system, you necessarily must read, understand and follow the following safety instructions and safety messages in this manual about danger causing property damage, before you install and operate your device.

2.5.1 Device Destruction by exceeding allowed Supply Voltage

Devices: NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE

To avoid destruction to your device due to high supply voltage, you must observe the following instructions. These instructions apply to all devices described in this manual.

The device may only be operated with the specified supply voltage. Make sure that the limits of the allowed range for the supply voltage are not exceeded. A supply voltage above the upper limit can cause severe damage to the device! A supply voltage below the lower limit can cause malfunction of the device. The allowed range for the supply voltage is defined by the tolerances specified in this manual.



The data on the permissible supply voltage of the devices described in this manual you find in the *Power Supply and Host Interface* on page 26.

Only NANL-C500-RE:

The device may not be powered by a 5 V supply voltage! The device may only be powered by a 3.3 V $\pm 5\%$ supply voltage.

2.5.2 Device Destruction by exceeding allowed Signaling Voltage

Devices: NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE

To avoid destruction to your device due to high signaling voltage, you must observe the following instructions. These instructions apply to all devices described in this manual.

- All I/O signal pins at the device tolerate only the specified signaling voltage!
- Operating the device with a signaling voltage other than the specified signaling voltage may lead to severe damage to the device!



The data on the permissible signaling voltage of the devices described in this manual you find in the section *Power Supply and Host Interface* on page 26.

2.5.3 Device Destruction by exceeding allowed External IO Interface Output Current

Devices: NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE

To avoid destruction to your device due to exceeding allowed external IO interface output current, you must observe the following instructions. These instructions apply to all devices described in this manual.

- During operation of the NANL-C500-RE card, of the NANL-B500E-RE device or of the NANL-B500G-RE device the specified device specific maximum values for the output current at the external IO interface I/O signal pins must not be exceeded.
- The netX chip and other components of the NANL-C500-RE card, of the NANL-B500E-RE device or of the NANL-B500G-RE device can be damaged if the output current at the external IO interface I/O signal pins exceeds the maximum permissible value!



The data on the maximum permissible output current at the I/O signal pins for the devices described in this manual you find in the section *Maximum permissible Output Current (external IO Interface)* on page 27.

2.5.4 Damage of externally attached Hardware

NANL-C500-RE, NANL-B500E-RE

- If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected to the NANL-C500-RE card or the NANL-B500E-RE device, check that the external device is suitable for the application.

NANL-B500G-RE

- If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.
- If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected to the NANL B500G device, check whether the value for the voltage for the NANL B500G device set in the netANALYZER software is correct. Furthermore, check whether the external device is suitable for the application.

2.5.5 Electrostatically sensitive Devices (NANL-C500-RE)

Only NANL-C500-RE:

This equipment is sensitive to electrostatic discharge, which cause internal damage and affect normal operation. Therefore adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge if you install or replace your device. Follow the guidelines listed hereafter when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on the device.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

Reference Safety [S3]

2.5.6 Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)

The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in **DHCP Server Operation** mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

The analyzer device NANL-B500G-RE works by default as an external DHCP server in the **DHCP Server Operation** mode independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

In order to connect the analyzer device NANL-B500G-RE to any network ensure that DHCP Server Operation mode is disabled.

2.6 Labeling of Safety Messages

- The **Section Safety Messages** at the beginning of a chapter are pinpointed particularly and highlighted by a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text and *optionally* by a specific safety sign.
- The **Integrated Safety Messages** within an instruction description are highlighted with a signal word according to the degree of endangerment. The kind of danger is specified exactly by the safety message text.

Signal Word	Meaning (international)	Meaning (USA)
	Indicates a direct hazard with high risk, which will have as consequence death or grievous bodily harm if it isn't avoided.	Indicates a Hazardous Situation Which if not Avoided, will Result in Death or Serious Injury.
	Indicates a possible hazard with medium risk, which will have as consequence death or (grievous) bodily harm if it isn't avoided.	Indicates a Hazardous Situation Which if not Avoided, could Result in Death or Serious Injury.
	Indicates a minor hazard with medium risk, which could have as consequence simple battery if it isn't avoided.	Indicates a Hazardous Situation Which if not Avoided, may Result in Minor or Moderate Injury.
Safety Sign	USA	Sort of Warning or Principle
		Warning of Lethal Electrical Shock
		Principle: Disconnect the Power Plug

Table 8: Signal Words and Safety Signa in Safety Messages on Personal Injury

Signal Word	Meaning (international and USA)
	Indicates a Property Damage Message.
Safety Sign	Sort of Warning or Principle
	Warning on Damages by Electrostatic Discharge
-	Example: Warning on Device Destruction due by too high supply voltage

Table 9: Signal Words and Safety Signa in Safety Messages on Property Damage

In this document all Safety Instructions and Safety Messages are designed according both to the international used safety conventions as well as to the ANSI Z535.6 standard, refer to reference safety [S1].

2.7 References Safety

- [S1] ANSI Z535.6-2006 American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials
- [S2] IEC 60950-1, Information technology equipment - Safety - Part 1: General requirements, (IEC 60950-1:2005, modified); German Edition EN 60950-1:2006
- [S3] EN 61340-5-1 and EN 61340-5-2 as well as IEC 61340-5-1 and IEC 61340-5-2

3 Description and Requirements

3.1 Introduction to the netANALYZER

You can use the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE to record the performance and the functions of individual systems or system components of bus systems, which conform to the Ethernet II IEEE 802.3 specification.

The analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE described in this user manual, act as a passive Ethernet analyzer in Real-Time Ethernet systems. The NANL-C500-RE card and the NANL-B500E-RE device or the NANL-B500G-RE device analyze the data traffic in a communication stretch and protocol the arriving Ethernet frames.

By use of the netANALYZER software **netANALYZER** the modes listed hereafter can be used:

Capture Data Mode

In the **Capture Data** mode, the data are recorded to the hard disk of the PC.

For further information refer to section *Recording and analyzing Data Traffic* beginning from page 23.

For data capturing two operating modes are provides:

- **Ethernet Mode** (Standard Capturing)

In the **Ethernet Mode** standard Ethernet telegrams are captured.

- **Transparent Mode**

In the **Transparent Mode** standard Ethernet telegrams are captured, which include the preamble and the SFD (=Start of Frame Delimiter).

For further information refer to section *Transparent Mode* beginning from page 115.

Timing Analysis Mode

In the **Timing Analysis** mode, no frame data are stored, only the time stamp of individual frames are analyzed. No data recording is performed.

For further information refer to section *Timing Analysis* beginning from page 116.

Netload Analysis

In the **Netload Analysis** mode, the netload of the telegrams is analyzed over the time. The data recording is performed in the background. The frame data are captured on the hard disk and can be used for further analysis in Wireshark.

For further information refer to section *Netload Analysis* beginning from page 128.

3.1.1 Recording and analyzing Data Traffic

For devices with two Ethernet channels the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE capture the Ethernet frames and adds the time stamps to them. Therefore the analyzer card or the analyzer device must be connected over two patch cables from one of the TAP to the Ethernet device connections.

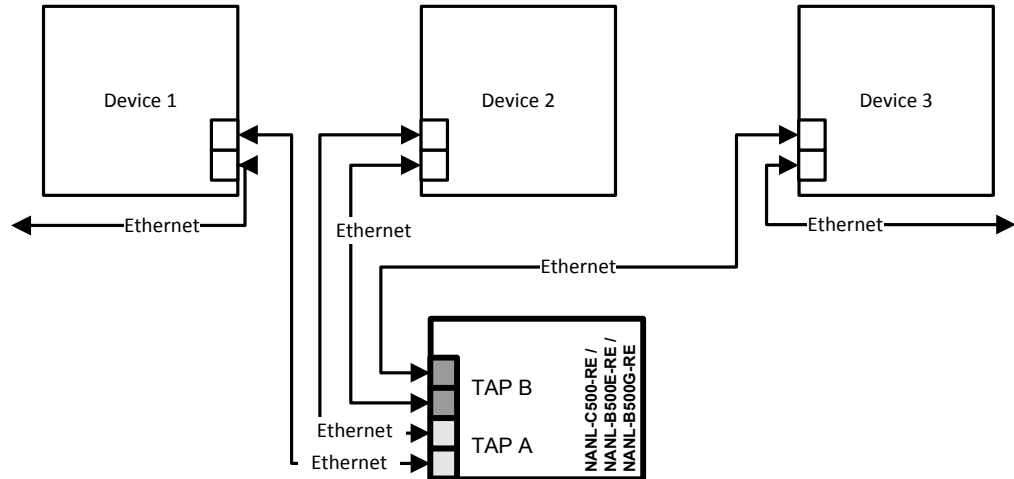


Figure 1: Typical Application (Use Case 2) - The communication between a device and its connection partners in a network should be analyzed

The data capturing must be configured and started via the **netANALYZER** software. This way the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE and the **netANALYZER** software capture the data packets of the communication line, transmit the data packets and save them on the hard disk.

On the analyzer card NANL-C500-RE or at the analyzer device NANL-B500E-RE or NANL-B500G-RE two TAP (Test Access Point) are integrated so that two communication channels are operational.

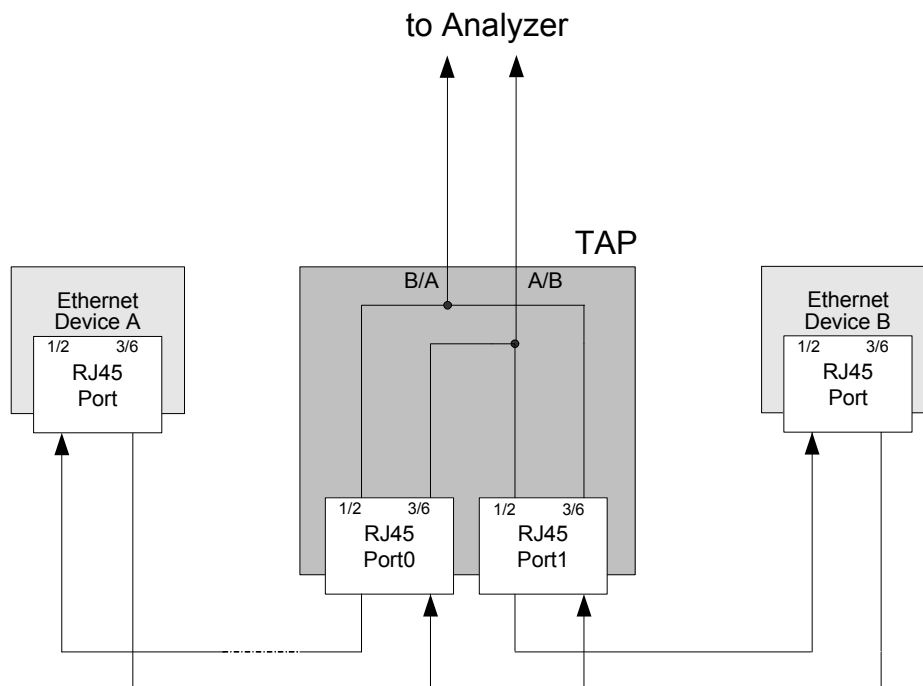


Figure 2: Example representation physical TAP

In combination with the driver and the firmware the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE store the data via DMA on the hard disk of the PC. There the **netANALYZER** software then converts the stored binary files (*.hea) in the open WinPcap format (*.pcap), which can be analyzed e. g. with Wireshark.

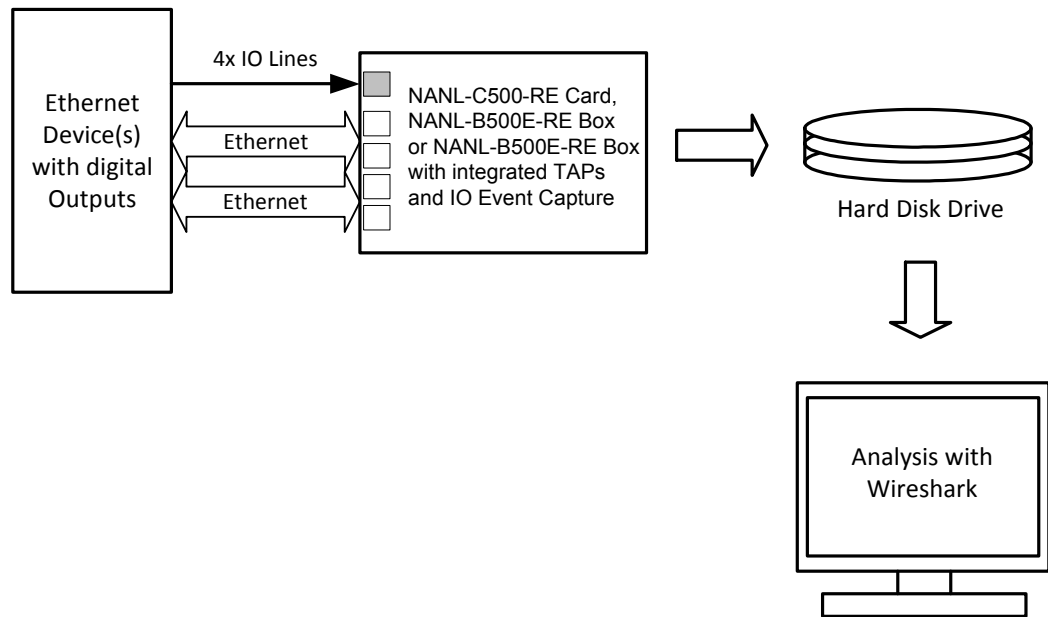


Figure 3: Typical Analyzer Application with the Capturing of the Ethernet Data Transfer and IO Events

Additionally, events of up to four digital inputs can be captured. At the four digital inputs the input signals produce a special Ethernet frame in the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE. This frame is not on the line, but is created for evaluation purposes.



Note: For the GPIO events in Wireshark a pseudo Ethernet frame is shown (MAC Address 00:02: A2: FF: FF: FF, Ether Type = 0x88ff), this is not a true Ethernet frame, but is inserted as wildcard in the firmware. Then this frame is decoded as GPIO event e. g. with Wireshark.

3.2 System Requirements

3.2.1 Hardware Requirements

PC or Notebook with the following specification:

- Intel compatible CPU, approx. 2 GHz or faster
- 1 GB RAM or more
- DVD ROM drive
- SVGA 1024x768 16bit colors or better
- 20 MB free hard drive space for the **netANALYZER** software
- At least 1 GB free hard disk memory (NTFS partitions) for data capturing
- Approx. 73 MB free hard disk memory for the **Wireshark** software
- 1 PCI slot* for NANL-C500-RE card
(*Supply Voltage 3.3 V, Signaling Voltage 5 V or 3.3 V)
- 1 ExpressCard Slot (notebook) for NANL-B500E-RE device
- 1 separate network card with RJ45 Ethernet socket (1 Gb/s)
(only for NANL-B500G-RE device)

Accessories:

- 2 patch cable (Ethernet)



Note: The maximum allowed total length of the Ethernet cable via which the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE within the Ethernet system are connected via a TAP to the devices in the system is 100 meters.

- The maximum allowed cable length for the 24V power supply is 3 meters.
- Power supply unit for NANL-B500G-RE device: 24V dc/ 1.3A



Note: The power supply unit (for standard applications) delivered with the NANL-B500G-RE device is designed as follows: 24V dc, 1.25A (1.8M KAB). See also section *Power Supply and Host Interface* on page 26.

3.2.2 Power Supply and Host Interface

For the power supply and the host interface used for the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE you must observe the following requirements:

netANALYZER Hardware	Supply Voltage	Signaling Voltage Host Interface	Host Interface	Signaling Voltage External IO
NANL-C500-RE	+3.3 V dc $\pm 5\%$ / 800 mA	5 V or 3.3 V	PCI slot	3.3 V
NANL-B500E-RE	24V dc / 180mA / 4.3W, 18V ... 30V DC	PCIe compatible	PCI Express slot (ExpressCard)	3.3 V
NANL-B500E-RE	24V DC / 1,3A / 31.2W, 18V ... 30V DC	-	RJ45 Ethernet socket (1 Gb/s)	3.3 V 1 mA or 24V / max. 600 mA

Table 10: Requirements Power Supply and Host Interface for NANL-C500-RE or NANL-B500E-RE

The data in the table above have the following meaning:

Supply Voltage

The required and permissible supply voltage at the analyzer card and the analyzer device

Signaling Voltage Host Interface

The required or tolerated signaling voltage at the I/O signal pins at the PCI bus of the analyzer card NANL-C500-RE or at the ExpressCard of the analyzer device NANL-B500E-RE.

Host Interface Type of the host interface

Signaling Voltage External IO

The required or tolerated signaling voltage at the I/O signal pins of the External IO interface of the analyzer card and the analyzer device.



Note: If the power supply unit delivered with the NANL-B500G-RE device (dc 24V / 1.25 A) is used, at 500 mA at the external IO interface of the NANL-B500G-RE device the current limiter is turned on. To avoid a reset of the analyzer device, use for this special case a more powerful power supply (24V dc / 1.3A).



For more see section *Power Supply NANL-B500E-RE* on page 143 and section *Power Supply NANL-B500G-RE* on page 144.

3.2.3 Maximum permissible Output Current (external IO Interface)

NANL-C500-RE and NANL-B500E-RE

For the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE (all hardware revisions) the maximum permissible output current for each of the I/O signal pins (pins 1, 3, 5, 7) at the external IO interface is:

10 mA (at 3.3V signaling voltage at the external IO interface).

Device Name	Device Type	Revision	Maximum Output Current at the external IO Interface in [mA] at 3.3 V Signaling Voltage			
			Pin 1	Pin 3	Pin 5	Pin 7
netANALYZER Card PCI RTE	NXANL 500-RE	2	10 mA	10 mA	10 mA	10 mA
	NXANL 500-RE	3				
	NANL-C500-RE	4				
netANALYZER portable Device PCIe RTE	NANL-B500E-RE	1	10 mA	10 mA	10 mA	10 mA
	NANL-B500E-RE	2				

Table 11: Maximum permissible Output Current (external IO Interface NANL-C500-RE, NANL-B500E-RE)

NANL-B500G-RE

For the analyzer device NANL-B500G-RE the maximum permissible output current at the external IO interface (for all I/O signal pins 1, 3, 5 and 7 in total) is:

25 mA (at 3.3V signaling voltage at the external IO interface).

600 mA (at 24V signaling voltage at the external IO interface).

Device Name	Device Type	Revision	Maximum Output Current at the external IO Interface in [mA] at 3.3 V or 24V Signaling Voltage			
			For Pin 1, Pin 3, Pin 5 and Pin 7 in total			
netANALYZER portable Device RTE Gigabit	NANL-B500G-RE	2	at 3,3V: 1 mA at 24V: 600 mA			
	NANL-B500G-RE	3				
	NANL-B500G-RE	4				

Table 12: Maximum permissible Output Current (external IO Interface NANL-B500G-RE)

3.3 Software Requirements

- Operating System:
 - Windows® XP Professional, SP3, (32-bit and 64-bit Version),
 - Windows® Vista, (32-bit and 64-bit Version),
 - Windows® 7, (32-bit and 64-bit Version),
 - Windows® 8, (32-bit and 64-bit Version).
- The program Microsoft .NET Framework Version 2.0 must be installed. The program can be downloaded from the Internet address: <http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=16614>
- In order to show the displayed data, a network monitoring program such as Wireshark must be installed that supports the WinPcap format. (Wireshark is "free software"), and can be downloaded from the Internet address: <http://www.wireshark.org/>. A special Hilscher Dissector is integrated in Wireshark.
- The **netANALYZER** software V 1.5.x.x must be installed. This includes the **netANALYZER** software, the Analyzer driver and the Analyzer firmware "Ethernet-Analyzer".

Only for analyzer device NANL-B500G-RE:

- The **Remote Access Client** must be installed.
- The program **Ethernet Device Configuration** must be installed.

4 Getting Started

4.1 Notes for Installation and Operation

You must read and obey the following notes about installation and operation of your analyzer card NANL-C500-RE or your analyzer device NANL-B500E-RE or NANL-B500G-RE to guarantee proper installation and an error-free operation of your device.

 Note	Description
Installation Sequence	The installation sequence: 1. Install Software from DVD. 2. Mount NANL-C500-RE or connect NANL-B500E-RE or NANL-B500G-RE. must be obeyed. Otherwise the result could be incorrect entries in the Registry. This again leads to malfunctions during later installation of software updates.
Optimum Operation if view Participants at PCI or PCI Express Bus	The capturing feature of the NANL-C500-RE card or the NANL-B500E-RE device works under heavy load optimally only if the number of participants in the communications PCI bus or PCI Express bus is minimized. It is advantageous when the NANL-C500-RE card is the only PCI card in the PC or when the NANL-B500E-RE device is the only ExpressCard at the notebook.
Inserting netANALYZER Hardware into the Communication Link	To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP (Test Access Port). The bandwidth of the network connection between the NANL-B500G-RE device and the PC must be sufficiently large to transport the resulting data of the four capturing interfaces. NANL-B500G-RE: Important! The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in DHCP Server Operation mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction. The analyzer device NANL-B500G-RE works by default as an external DHCP server in the DHCP Server Operation mode independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements. In order to connect the analyzer device NANL-B500G-RE to any network ensure that DHCP Server Operation mode is disabled.
Damage of externally attached Hardware	NANL-C500-RE, NANL-B500E-RE: ▪ If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven. ▪ Before an external device is connected, check that the external device is suitable for the application. NANL-B500G-RE: ▪ If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven. ▪ If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven. ▪ Before an external device is connected, check whether the value for the voltage set in the netANALYZER software is correct. Furthermore, check whether the external device is suitable for the application.
Do not unplug the ExpressCard during the Device Operation	During device operation do not unplug the ExpressCard of the analyzer device NANL-B500E-RE from the ExpressCard slot at the Notebook. Otherwise data capturing is stopped and an error message is displayed, as the device is not any more detected at the notebook.
Auto-Crossover and Port-Switching	Because of the auto-crossover function of most of the RTE systems, the assignment of port 0 and 1 or port 2 and 3 at the netANALYZER device can change between different test runs. For more information refer to section <i>Auto-Crossover and Port-Switching</i> on page 72.

 Note	Description
Transferring NANL-B500G-RE data save without loss to the PC	Important! The color of both LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur. For more see section <i>LINK-ACT</i> and <i>LINK-1000/LINK100 (Reverse Side)</i> on page 142.
Saved Ethernet connection from NANL-B500G-RE to the PC	Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, to strong interference can lead to a disconnection.

Table 13: Notes about Installation and Operation

4.2 Notes for Wireshark before V1.7.1

 Note	Description
Wireshark netANALYZER Plugin (not required for Wireshark 1.7.1 and newer)	For Wireshark 1.7.1 and newer the Wireshark netANALYZER plugin is not required any more. ➤ Update wireshark to the latest version. For earlier Wireshark versions already installed before V1.7.1 the Wireshark netANALYZER plugin must be installed to allow displaying the netANALYZER port number and error codes for every telegram in Wireshark. For more information refer to section <i>Wireshark netANALYZER Plugin before Wireshark 1.7.1</i> on page 156.
Activating Wireshark GPIO Dissector (not required for Wireshark 1.7.1 and newer)	For Wireshark versions before V1.7.1 the Wireshark GPIO dissector must be activated. For more information refer to section <i>Activating GPIO Dissector for Wireshark before V1.7.1</i> on page 161. For Wireshark 1.7.1 and newer activating the Wireshark GPIO dissector is not any more required.

Table 14: Notes for Wireshark before V1.7.1

4.3 Overview Software and Hardware Installation

No	Step	Short Description	Detailed Information, see Chapter / Section	Page
1	Software Installation			
1.1	Requirements	- Install .NET Framework - Install Wireshark	<i>System Requirements</i>	25
1.2	Install netANALYZER Software	- Insert the netANALYZER DVD . If the installation program does not start automatically start the <i>netAnalyzer.msi</i> or <i>Setup.exe</i> program in the root folder of the DVD. - Run the setup for the netANALYZER software. - Answer the question netANALYZER optionally uses the Microsoft .NET 2.0 Framework. Would you like to install it now? with "No". - Install the netANALYZER / netSCOPE Device Driver and the netANALYZER software. The netANALYZER Wireshark Plugin is only required for earlier Wireshark versions already installed before V1.7.1. Therefore the netANALYZER setup 1.5.x.x contains the plugin installer.	<i>Software Installation</i> <i>Wireshark netANALYZER Plugin before Wireshark 1.7.1</i>	39 156
1.3	<u>Only for Analyzer Device NANL-B500G-RE</u>	- Install the Remote Access Client .	<i>Installation Remote Access Windows Client (only NANL-B500G-RE)</i>	44
1.4		- Install the program Ethernet Device Configuration .	<i>Installation Ethernet Device Configuration (only NANL-B500G-RE)</i>	51
2	Hardware Installation			
2.1	Safety Messages	Adhere - to the Safety Messages on Personal Injury - and to the Property Damage Messages given in this manual.	<i>Safety Messages on Personal Injury, Property Damage Messages</i>	60, 61
2.2	NANL-C500-RE	Mount the analyzer card NANL-C500-RE into a free PCI slot in the PC.	<i>Mounting Analyzer Card NANL-C500-RE to the PC</i>	64
2.3	OR NANL-B500E-RE	Connect the analyzer device NANL-B500E-RE to the notebook. NOTICE Connect only <u>one</u> 24 V DC power supply to the device.	<i>Connecting Analyzer Device NANL-B500E-RE to the Notebook</i>	65
2.4	OR NANL-B500G-RE	Connect the analyzer device NANL-B500G-RE to the RJ45 Ethernet socket (1 Gb/s) at the separate network card with in the PC.	<i>Connecting Analyzer Device NANL-B500G-RE to the PC</i>	66
2.5	Inserting Hardware in the communication link	 Note: The RJ45 socket is only for use in LAN, not for telecommunication circuits.  Important! The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in DHCP Server Operation mode. Insert the NANL-C500-RE card or the NANL-B500E-RE or NANL-B500G-RE device into the communication link to be analyzed.	<i>Inserting netANALYZER Hardware into the Communication Link</i>	67
2.6	Wireshark GPIO Dissector (<i>not required for Wireshark V1.7.1 and higher</i>)	Activate Wireshark GPIO Dissector.	<i>Activating GPIO Dissector for Wireshark before V1.7.1</i>	161
2.7	File Settings	Set file name and capturing path for the capturing process.	<i>Performing File Settings</i>	87

Table 15: Overview Software and Hardware Installation

4.4 Overview how to update Hardware, Software and Driver

No	Step	Short Description	Detailed Information, see the Documentation / Chapter / Section	Page
1.	Hardware Update	<u>Only for existing hardware installation for NXANL 500-RE Rev 2 und Rev 3:</u>		
		Apply the netANALYZER hardware update and then update the driver and the software.	<i>Hardware Update for NXANL 500-RE Rev 2 and Rev 3</i>	153
2	Update Driver, Software and Plugin			
2.1	Uninstall earlier Versions of the netANALYZER Software or of the netANALYZER Device Driver	- For Windows 7 select Start > Control Panel > Uninstall a program. - In the Uninstall or change a program window select the netANALYZER or the netANALYZER Device Driver via the right mouse button, select the Uninstall entry and remove the software or the driver.		
2.2	Uninstall earlier Plugins	If so uninstall earlier netANALYZER Wireshark Plugin version.	<i>Uninstalling manually installed Plugin</i>	156
2.3	Install latest netANALYZER Software	- Insert the current netANALYZER DVD to the DVD drive - Run the setup for the netANALYZER software. - Install the netANALYZER / netSCOPE Device Driver and the netANALYZER software. The netANALYZER Wireshark Plugin is only required for earlier Wireshark versions already installed before V1.7.1	<i>How to install the netANALYZER Driver and Software</i> <i>Wireshark netANALYZER Plugin before Wireshark 1.7.1</i>	40 156
2.4	Update the NANL-B500G-RE Firmware	 Note: The IP address of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online. - Find out the IP address of the device by using the Ethernet Device Configuration program,. - Enter the found IP address in the address bar of Windows Explorer. - Enter the user name "update" and the password "nanl-b500g-re" into the FTP server log on screen. - Copy the firmware update file from the netANALYZER DVD into the netANALYZER FTP server directory.	<i>How to update the NANL-B500G-RE Firmware</i>	73
3	Restart PC			
		To run the netANALYZER software properly you must restart your PC.		
4	Complete Driver Installation			
		After you restarted the PC the Found New Hardware Wizard is started. - Select No, not this time and click Next. - Select Install from a list or specific location (Advanced) and click Next. - Select Don't search. I will choose the driver to install. and click Next. - Select the netANALYZER / netSCOPE Device Driver and click Next. - The wizard installs the software.		

Table 16: Overview how to update the netANALYZER Hardware, Software and Driver

4.5 Overview Settings an Analysis Methods

No	Step	Short Description	Detailed Information, see the Documentation / Chapter / Section	Page
1	Settings			
1.1	Starting netANALYZER Software and selecting Device	Start the netANALYZER software and select the netANALYZER device for data capturing and analysis. If you have two or more netANALYZER devices connected to your PC, you can open the netANALYZER software (beginning with the version 1.4.x.x) for several devices multiple times in parallel.	<i>netANALYZER Software</i> <i>Starting the netANALYZER Software multiple Times</i>	78 78
1.2	Selecting Ports and Analysis Method for Data Capturing	In the netANALYZER main window, you must set the Ports to be used for the capturing and which Analysis Methods are to be used. Furthermore you can read here the data about the captured frames, the found errors, the bus load and for the capturing time, you can open the window to convert a binary format files into the WinPcap format and read the status bar reports on the status of the application, the firmware or the driver and the GPIOs (external inputs/outputs).	<i>netANALYZER Main Window</i>	83
1.3	Defining Number, Name and Allocation for Binary Files (*.hea)	In the File Settings window you can determine the number of binary files to be stored, define, that the capturing data are to be stored to the ring buffer, define the systematic name of the *.hea files and where the binary files will be stored.	<i>Performing File Settings</i>	87
1.4	GPIO and Trigger Configuration	In the GPIO Settings window you assign a GPIO event to every GPIO (external input/output) and define, how the capturing shall be started or stopped and a delay time.	<i>GPIO Settings</i>	89
1.5	Setting the Transmission Rate for Port 0 to Port 3 manually	Via PHY Settings you can manually set the data transmission rate per port.	<i>PHY Settings</i>	95
1.6	Analysis Configuration	In the Analysis Configuration you define for the Timing Analysis, whether you will use the Extended Software Filter Settings and whether the graph of the analysis data will be displayed as a Histogram or as a History or as a combined Histogram and History graph. The Netload Analysis always used the extended software filters.	<i>Analysis Configuration</i>	106
2	Filter Settings			
2.1	Hardware Filter Settings	Selecting analysis data using pre-defined filter masks or defining own filter masks.	<i>Filter Settings for the Hardware Filters</i>	91
2.2	Extended Software Filter Settings	Selecting analysis data using pre-defined filters or defining own filters.	<i>Extended Software Filter Settings</i>	96
3	Data Capturing			
3.1	Starting Data Capturing	Start the capturing process of the received Ethernet frames.	<i>Starting Data Capturing</i>	108
3.2	Converting binary Files into WinPcap Format	Convert binary files *.hea into WinPcap format *.pcap.	<i>Converting Binary Files into WinPcap Format</i>	109
3.3	Displaying Analysis Data	Display analysis data of the Ethernet Frames using e. g. Wireshark.	<i>See help of the used network monitoring program</i>	-
4	Timing Analysis			
4.1	Presettings	Enter title, select port, configure axis and histogram settings.	<i>Timing Analysis</i>	116
4.2	Data Evaluation	Measuring value and histogram evaluation.	<i>Extended Software Filter Settings</i>	96

No	Step	Short Description	Detailed Information, see the Documentation / Chapter / Section	Page
5	Netload Analysis			
5.1	Analyzing captured telegrams	Analyzing the netload of the captured telegrams over the time and capturing the frame data.	<i>Netload Analysis</i>	128

Table 17: Overview Settings, Filter Settings and Analysis Methods

5 Device Drawings netANALYZER Hardware

5.1 Analyzer Card NANL-C500-RE

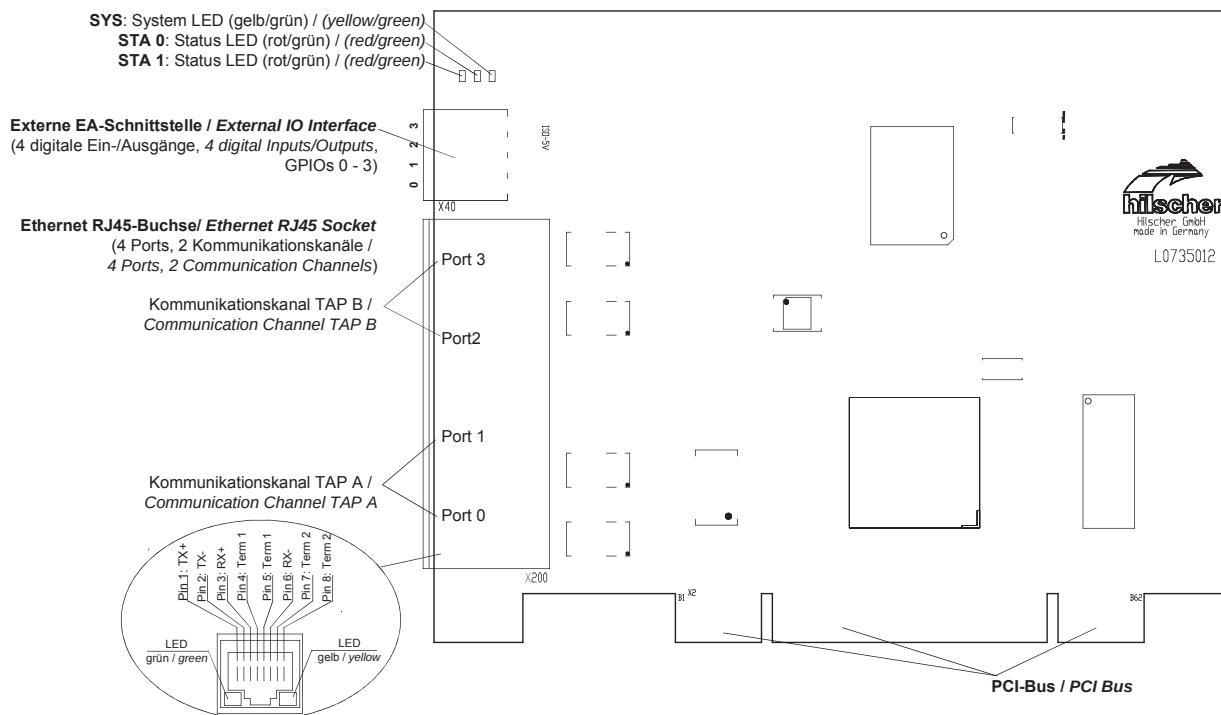
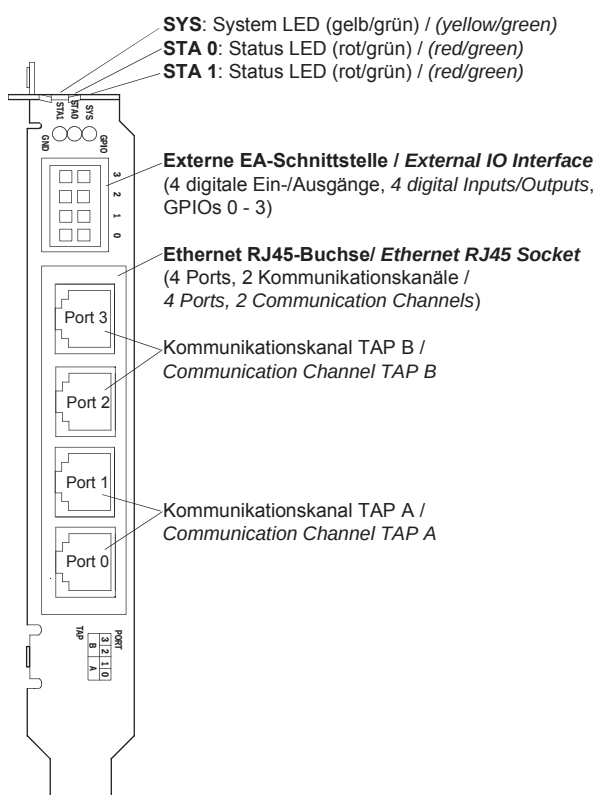


Figure: Top Side



Note: To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP (Test Application Point).

Figure 4: Top Side and Front Plate Analyzer Card NANL-C500-RE

5.2 Analyzer Device NANL-B500E-RE

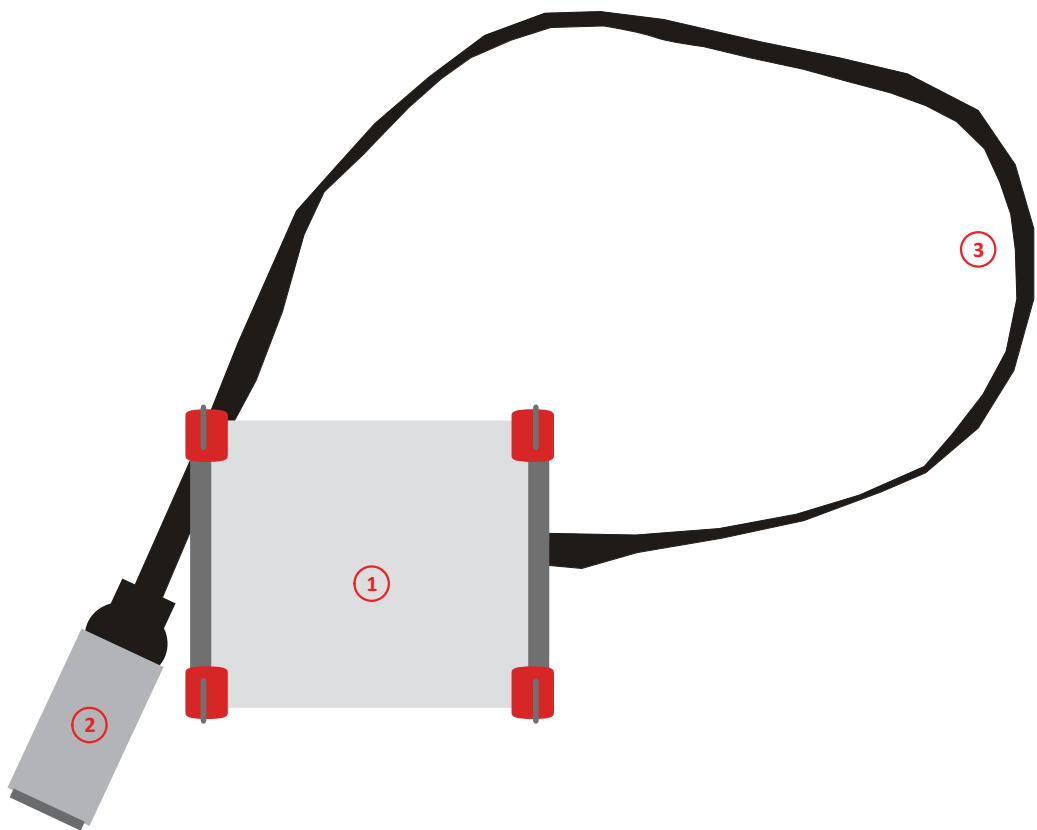


Figure 5: Overview Analyzer Device NANL-B500E-RE (with ExpressCard)

①	Analyzer Device NANL-B500E-RE
②	ExpressCard
③	ExpressCard Cable

Table 18: Explanations to the Overview NANL-B500E-RE

Figure: Front Side

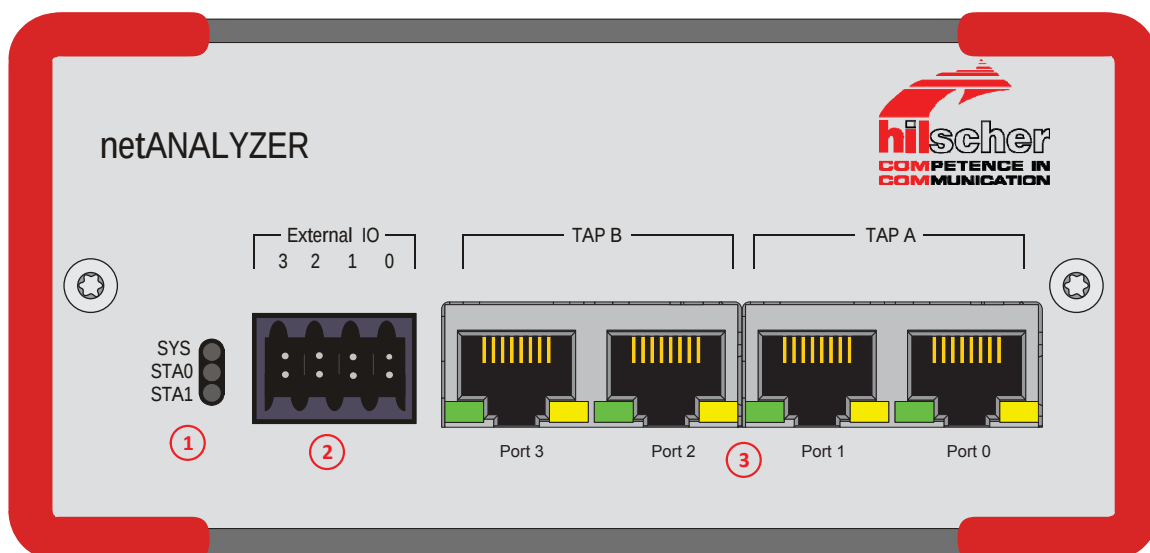


Figure: Reverse Side

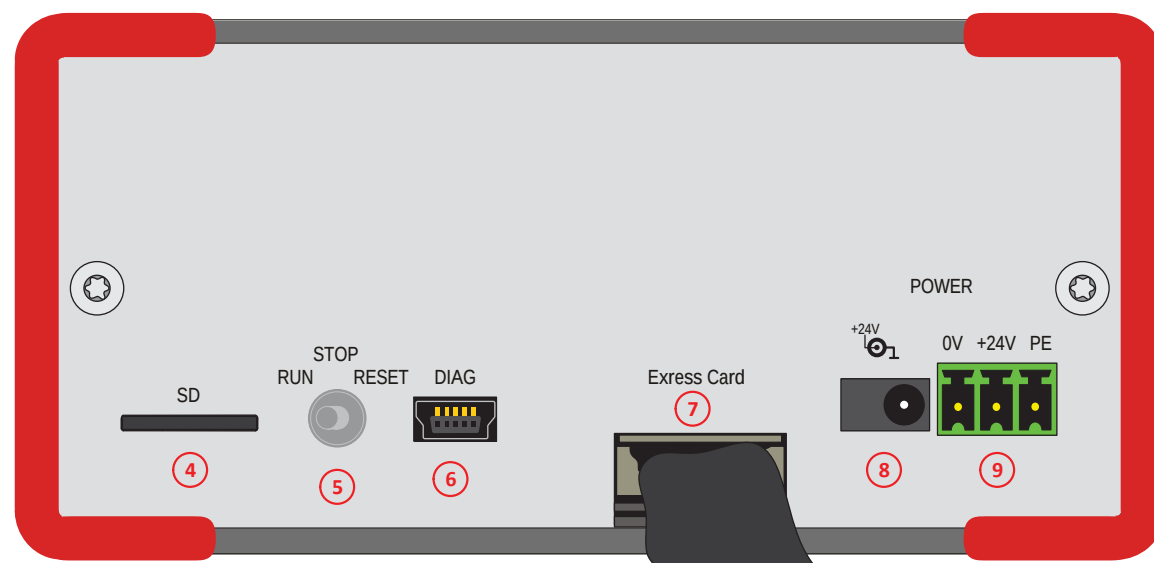


Figure 6: Front Side and Reverse Side Analyzer Device NANL-B500E-RE

①	SYS System LED (yellow/green), STA 0 , STA1 Status LEDs (red/green)
②	External IO Interface External Interface Input/Output Signals with 4 digital Inputs/Outputs (GPIOs 0 to 3)
③	Ethernet RJ45 Sockets (4 Ports): Port 0 to Port 3, 2 Communication Channels: TAP B, TAP A  Note: To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP (Test Application Point).
④	Micro SD Card Slot*
⑤	Switch* (RUN / STOP / RESET)
⑥	Mini B USB Plug* (5-pin)
⑦	Cable to ExpressCard
⑧	Alternative Female Connector +24V to connect power supply
⑨	24V Voltage Supply Combicon: 0V/+24V/PE
	* for future use only

Table 19: Explanations to the Front Side and Reverse Side NANL-B500E-RE

5.3 Analyzer Device NANL-B500G-RE

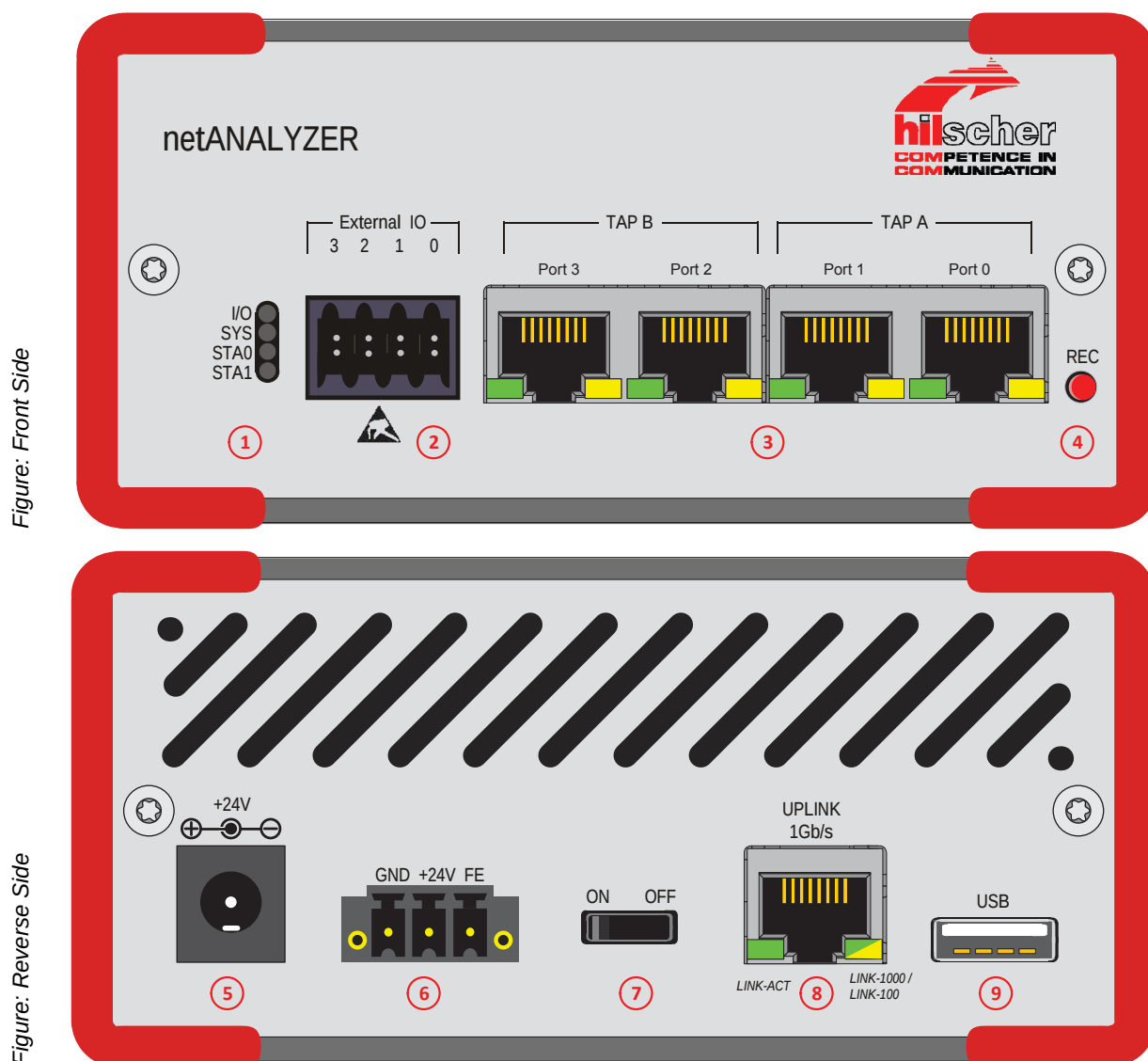


Figure 7: Front Side and Reverse Side Analyzer Device NANL-B500G-RE

①	SYS System LED (yellow/green), STA 0 , STA1 Status LEDs (red/green) , IO Status-LED (red/green)
②	External IO Interface External Interface Input/Output Signals with 4 digital Inputs/Outputs (GPIOs 0 to 3)
③	Ethernet RJ45 Sockets (4 Ports): Port 0 to Port 3, 2 Communication Channels: TAP B, TAP A ➔ Note: To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP (Test Application Point).
④	REC: Button to enable data recording* (Additional function: Restores the default setting for the IP address of your device (DHCP server mode) - While turning on your device press the REC button for about minute.)
⑤	Alternative Female Connector +24V to connect power supply
⑥	24V Voltage Supply Combicon: GND/+24V/FE
⑦	Power Switch (ON / OFF)
⑧	Gigabit Ethernet RJ45 Socket to the PC (1 Port with 1 Gb/s)
⑨	USB Plug* (Typ A, 4-pin)
	* for future use only

Table 20: Explanations to the Front Side and Reverse Side NANL-B500G-RE

6 Software Installation and Configuration

6.1 netANALYZER Autostart Menu

For the software installation for your netANALYZER device the netANALYZER DVD provides the netANALYZER / netSCOPE Device Driver, the netANALYZER Software, documentations and programming examples.

Autostart Menu of the netANALYZER DVD

In the autostart menu you can select:



Figure 8: Autostart Menu of the netANALYZER Installation DVD

Driver, Software and Plugin

If you select **Install netANALYZER** in the Autostart Menu, then you can select in the subsequent dialog:

For 32-Bit

- netANALYZER / netSCOPE Device Driver (x86)
- netANALYZER Graphical User Interface
- Wireshark Plugin (not required for Wireshark 1.7.1 and newer)

For 64-Bit

- netANALYZER / netSCOPE Device Driver (x64)
- netANALYZER Graphical User Interface
- Wireshark Plugin (not required for Wireshark 1.7.1 and newer)

Firmware Update (only NANL-B500G-RE)

Information to this question you find in section *How to update the NANL-B500G-RE Firmware* on page 73.

Documentation and Examples

Via the autostart menu you can also access to:

- The documentation (netANALYZER User and Driver Manual)
- 2 Examples for the netANALYZER Application Programming Interface (API)

6.2 How to install the netANALYZER Driver and Software



Important! Before installing the netANALYZER / netSCOPE Device Driver or before installing the software any existing old driver versions must be uninstalled.

To install the driver or the software proceed as described hereafter:

1. Close all programs!
 2. Enter the netANALYZER Installation DVD in the local DVD ROM drive.
- The start screen of the autostart menu is displayed with the following options:

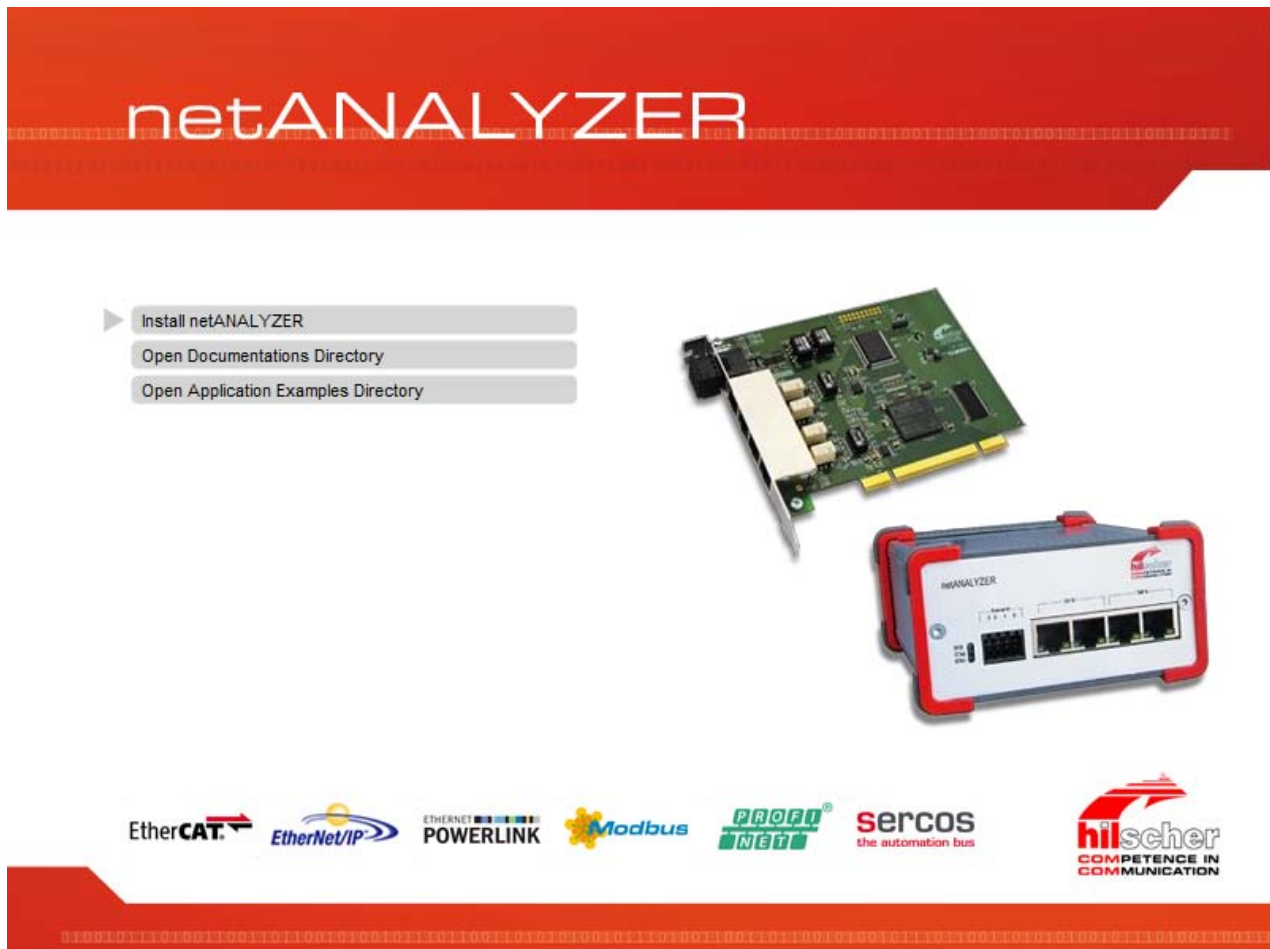


Figure 9: Autostart Menu netANALYZER Installation DVD

3. Select **Install netANALYZER** in the autostart menu.



Note: Under Windows® you need administration rights for the installation!

➤ The dialog **Install netANALYZER** appears.

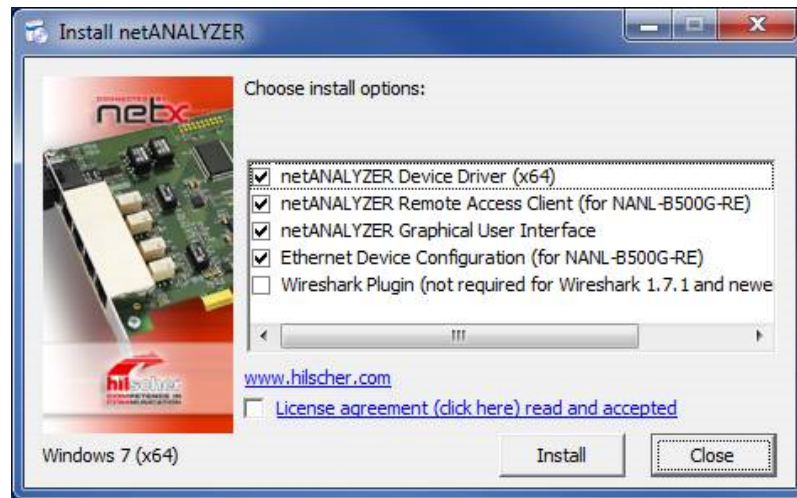


Figure 10: Install netANALYZER Dialog (Example Windows 7)

4. In the dialog **Install netANALYZER** select the installation options:



Note: Each of the options can be selected individually.

- **netANALYZER / netSCOPE Device Driver (x86)** for 32-Bit or **netANALYZER / netSCOPE Device Driver (x64)** for 64-Bit
Which of the two options is displayed, depends on the PC you are using.
- **netANALYZER Remote Access Windows Client (for NANL-B500G-RE)**
- **netANALYZER Graphical User Interface**
- **Ethernet Device Configuration (for NANL-B500G-RE)**
- **Wireshark Plugin (not required for Wireshark 1.7.1 and newer)**
You only require the **Wireshark Plugin** if you are using a version of Wireshark older than V1.7.1.



Note: For the Analyzer device NANL-B500G-RE the **netANALYZER Remote Access Windows Client** and the program **Ethernet Device Configuration** must be installed.

Further:

- Check **License agreement (click here) read and accepted**.
- Click on **Install**.
- The installation is started.

6.2.1 Installation netANALYZER / netSCOPE Device Driver

This section describes the installation procedure of the netANALYZER / netSCOPE Device Driver.

- Start the installation via the netANALYZER autostart menu. See also *netANALYZER Autostart Menu* page 39.
- The netANALYZER / netSCOPE Device Driver Setup Wizard opens. The screen **Please read the netANALYZER / netSCOPE Device Driver License Agreement** is displayed:



Figure 11: Hilscher Software License Agreement

- Check **I accept the terms in the License Agreement**.
- Start the netANALYZER / netSCOPE Device Driver Installation via **Install**.
- The screen **Installing netANALYZER / netSCOPE Device Driver** is displayed:

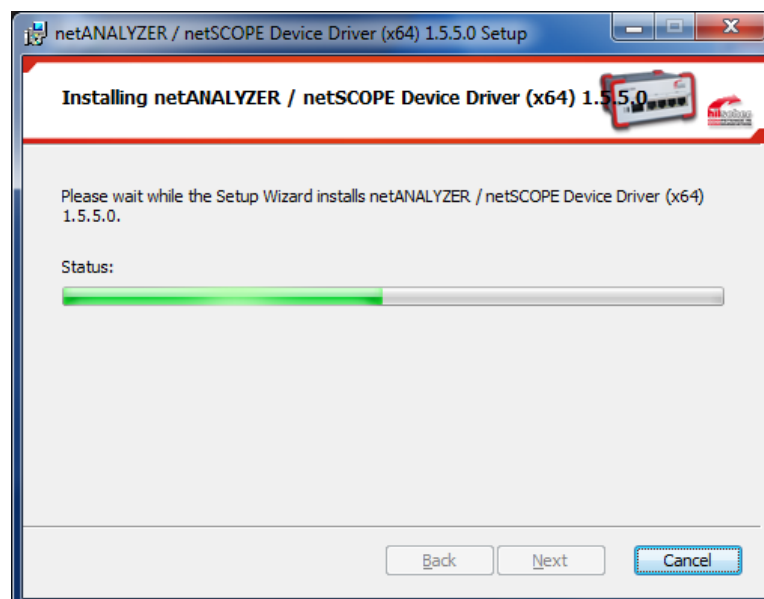


Figure 12: netANALYZER / netSCOPE Device Driver Installation

- The screen **Completed the netANALYZER / netSCOPE Device Driver Setup Wizard** is displayed:

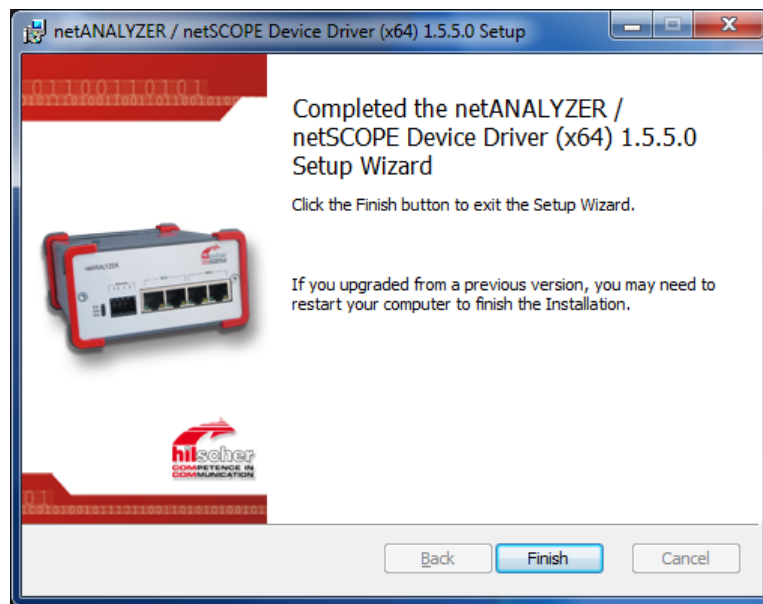


Figure 13: Finishing the netANALYZER / netSCOPE Device Driver Installation

- Finish the netANALYZER / netSCOPE Device Driver Installation via **Finish**.

- The netANALYZER / netSCOPE Device Driver Installation is complete.



For information on how to handle the manual installation of the driver refer to section *Hints on how to install the netANALYZER Driver manually* on page 155.

6.2.2 Installation Remote Access Windows Client (only NANL-B500G-RE)

This section describes the installation procedure of the Remote Access Windows Client. The Installation is started via the netANALYZER autostart menu. See also *netANALYZER Autostart Menu* page 39.

- Alternatively double click on the *netANALYZER Remote Access Windows Client.exe* setup file.
- The screen **Welcome to the netANALYZER Remote Access Windows Client** is displayed:



Figure 14: netANALYZER Remote Access Windows Client Setup Wizard: The Setup Wizard will install the netANALYZER Remote Access Windows Client on your computer. (Example 64bit)

- Click to **Next**.
- The screen **End-User License Agreement** is displayed:

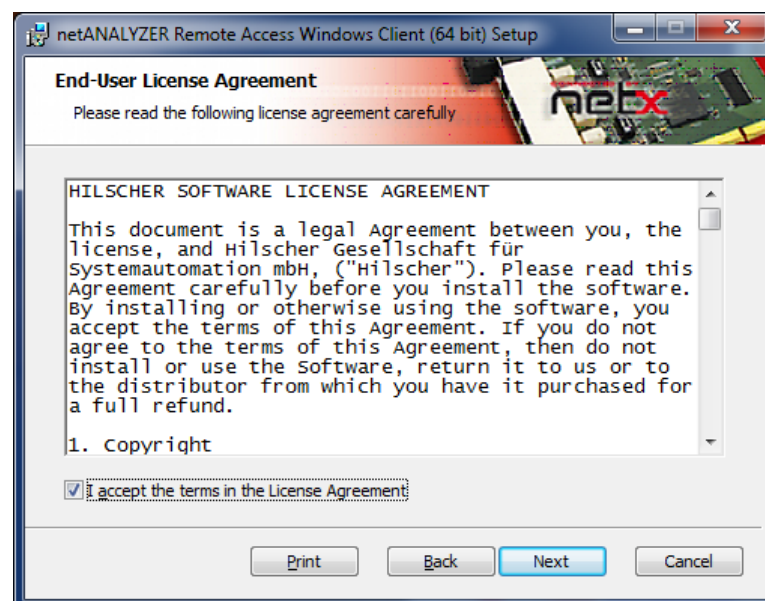


Figure 15: netANALYZER Remote Access Windows Client Setup Wizard: Hilscher Software License Agreement

- Check **I accept terms in the License Agreement**.
- The screen **Destination Folder** is displayed:

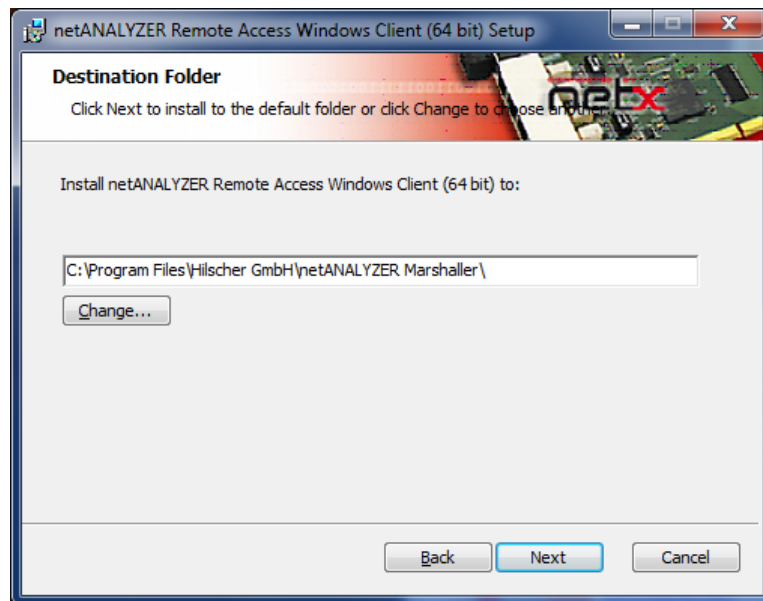


Figure 16: netANALYZER Remote Access Windows Client Setup Wizard: Defining the Installation Directory

- Under **Install netANALYZER Remote Access Windows Client** to define the installation folder.
- Possibly select via **Change...** a different directory.
- The screen **Ready to install netANALYZER Remote Access Windows Client** is displayed:

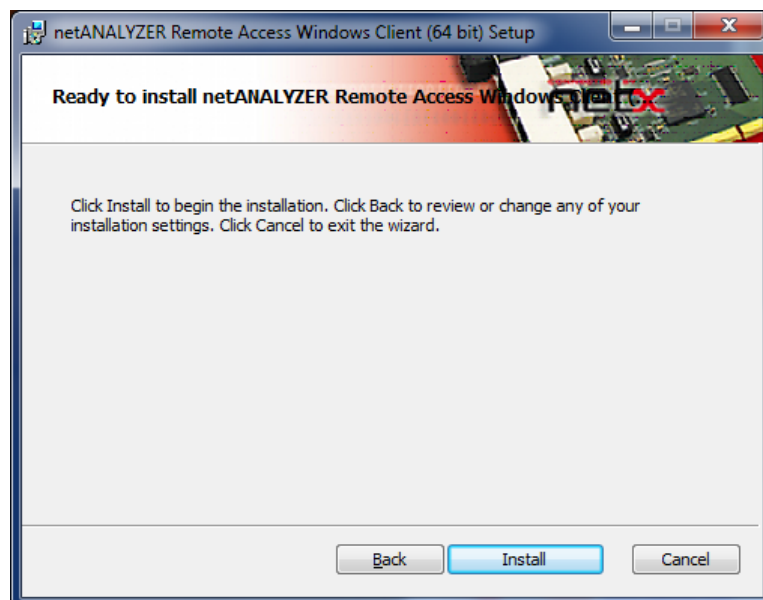


Figure 17: netANALYZER Remote Access Windows Client Setup Wizard: Starting the netANALYZER Remote Access Windows Client Installation

- The screen **Installing netANALYZER Remote Access Windows Client** is displayed:

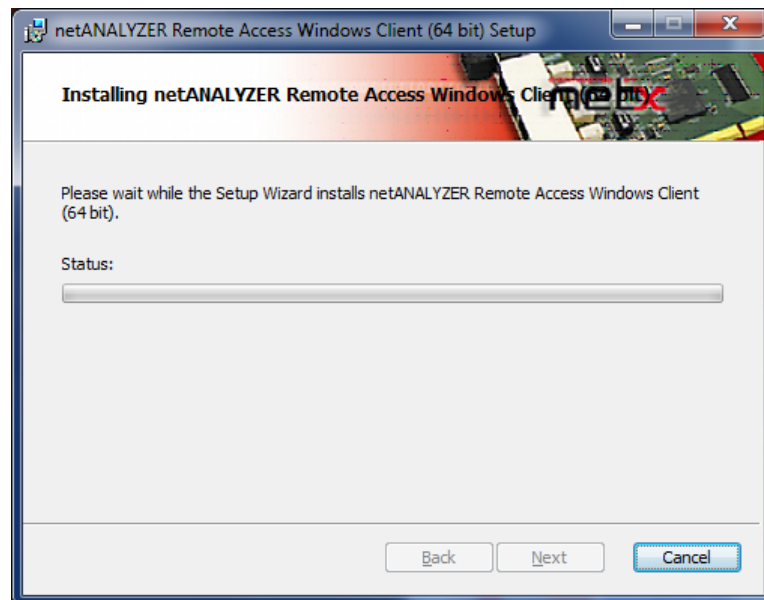


Figure 18: netANALYZER Remote Access Windows Client Setup Wizard: netANALYZER Remote Access Windows Client Installation

- The screen **Complete the netANALYZER Remote Access Windows Client Setup Wizard** is displayed:

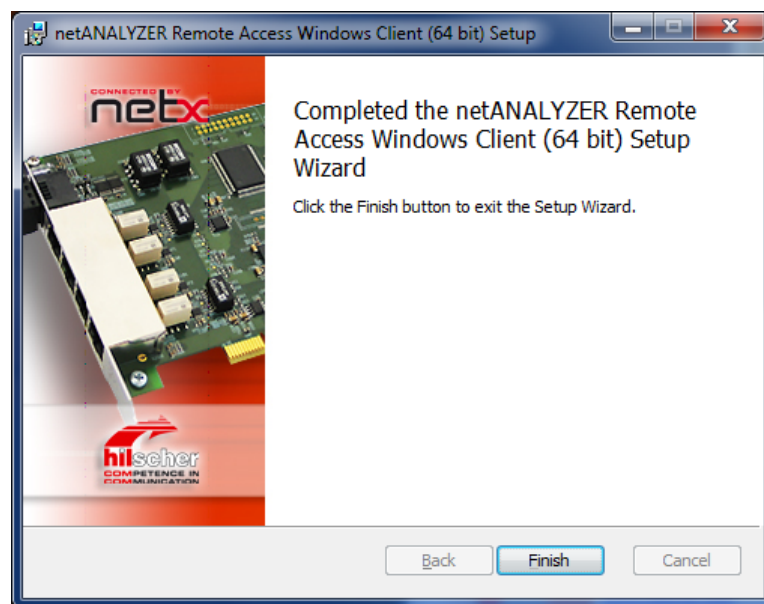


Figure 19: netANALYZER Remote Access Windows Client Setup Wizard: Finish netANALYZER Remote Access Windows Client Installation

- Close the netANALYZER Remote Access Windows Client installation via **Finish**.
- The netANALYZER Remote Access Windows Client installation is complete.

6.2.3 Installation netANALYZER Software

This section describes the installation procedure of the netANALYZER Software. The Installation is started via the netANALYZER autostart menu. See also *netANALYZER Autostart Menu* page 39.

- The screen **Welcome to the netANALYZER Setup Wizard** is displayed:

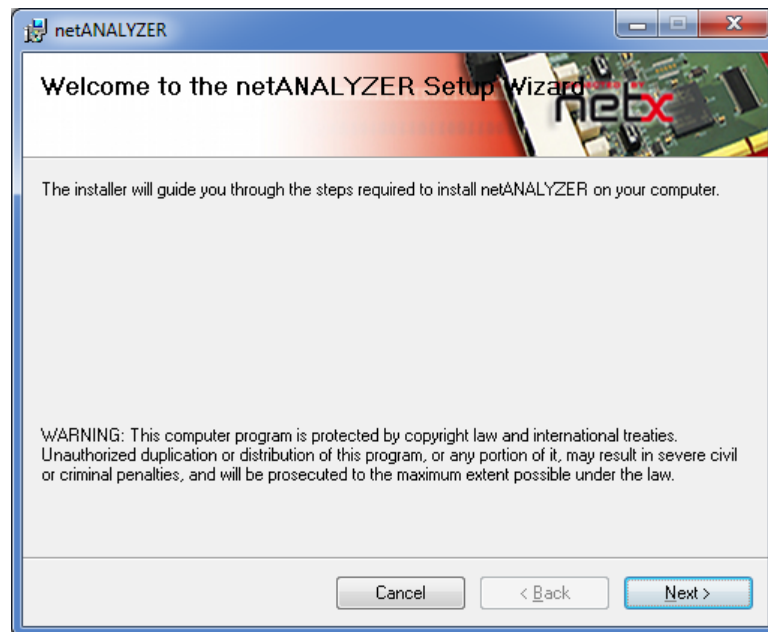


Figure 20: netANALYZER Setup Wizard: The Installer guides you through the Setup.

- Click to **Next**.
- The screen **License Agreement** is displayed:



Figure 21: netANALYZER Setup Wizard: Hilscher Software License Agreement

- Click to **I Agree**.
- The screen **Select Installation Folder** is displayed:

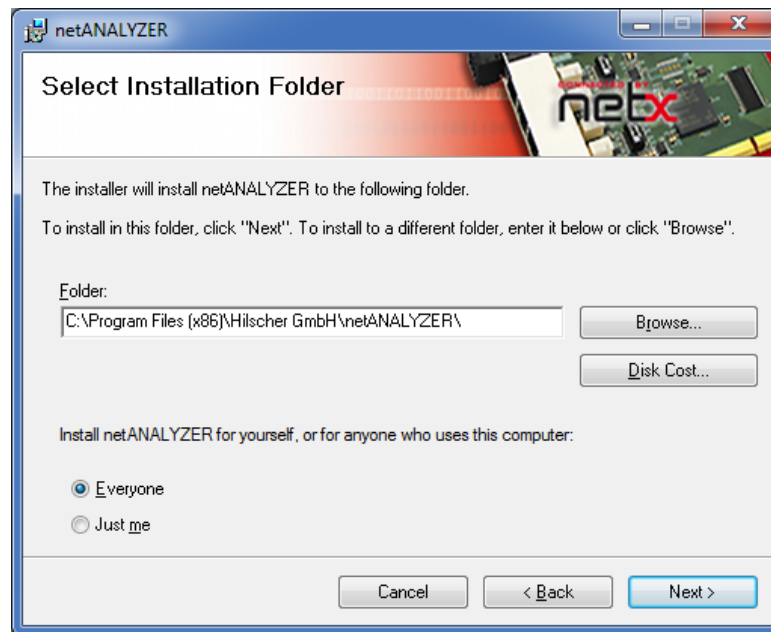


Figure 22: netANALYZER Setup Wizard: Defining the Installation Directory and the User

- Under **Folder** define the installation folder.
- Possibly select via **Browse...** a different directory.
- Possibly check via **Disk Cost...** the free disk space.
- Define the user: **Everyone** or **Just me**.

➤ The screen **Confirm Installation** is displayed:

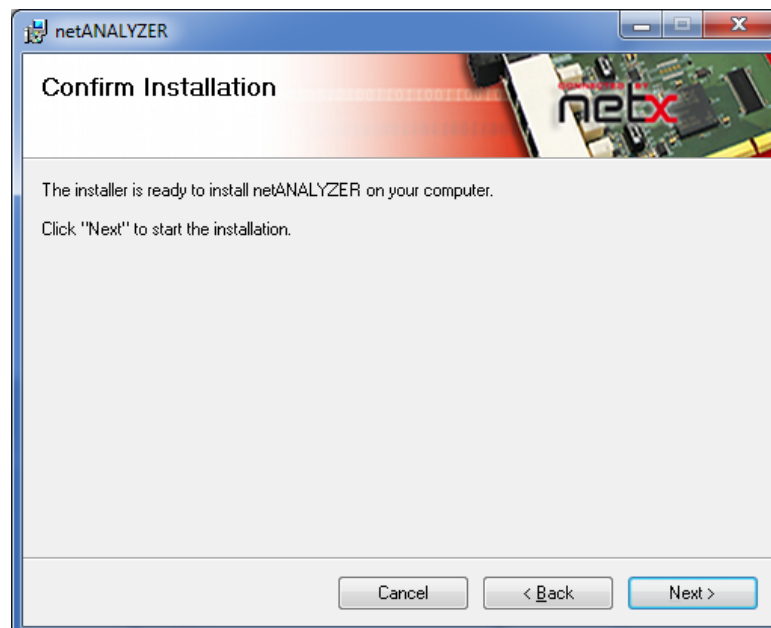


Figure 23: netANALYZER Setup Wizard: Starting the netANALYZER Installation

- Start the netANALYZER installation via **Next**.
- The screen **Installing netANALYZER** is displayed:

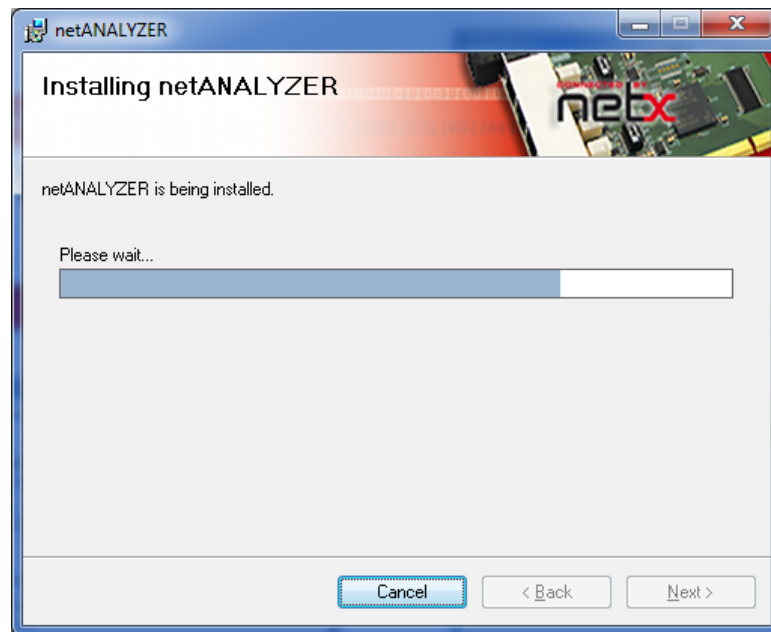


Figure 24: netANALYZER Setup Wizard: netANALYZER Installation

➤ The screen **Installation complete** is displayed:

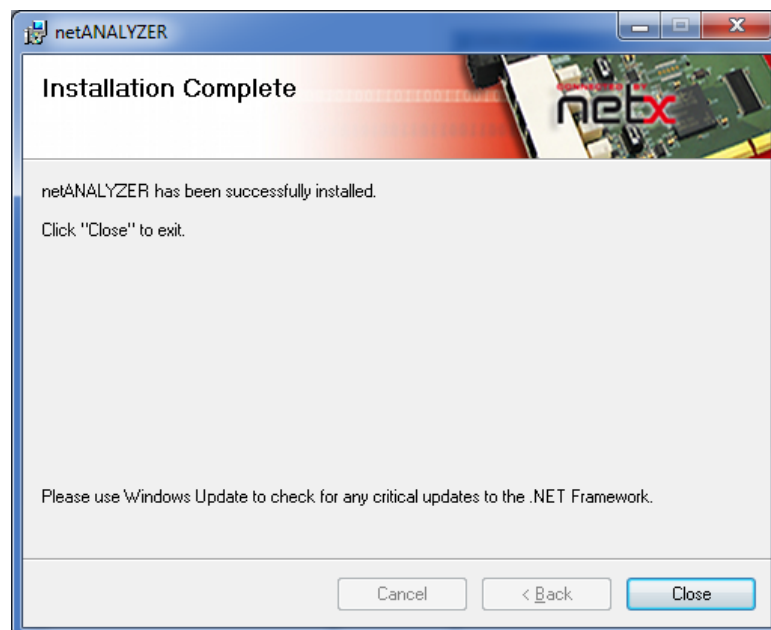


Figure 25: netANALYZER Setup Wizard: Closing the netANALYZER Installation

➤ Close the netANALYZER installation via **Close**.

➤ The netANALYZER installation is complete.

6.2.4 Default Paths for .hea Files and Software Filters

.hea Files:

The netANALYZER software installation prepares the path:

"My Documents\netANALYZER\hea"

This is the default path for .hea files. After the first usage of the netANALYZER software, the last used path is the default path. For further information refer to section *Performing File Settings* on page 87.

Software Filters:

Upon netANALYZER installation software filter examples are installed to:

"My Documents\netANALYZER\Software Filter"

This is the default path when a filter shall be loaded or saved in the **Extended Software Filter** dialog. After the first usage of the netANALYZER software, the last used path is the default path. For further information refer to section *Extended Software Filters* on page 97.

6.2.5 Installation Ethernet Device Configuration (only NANL-B500G-RE)

This section describes the installation procedure of the Ethernet Device Configuration program. The Installation is started via the netANALYZER autostart menu. See also *netANALYZER Autostart Menu* page 39.

- Alternatively double click on the *EnDevConfigTool.msi* setup file.
- The screen **Welcome to the Ethernet Device Configuration Setup Wizard** is displayed:



Figure 26: Ethernet Device Configuration Setup Wizard: The Setup Wizard will install the Ethernet Device Configuration on your computer.

- Click to **Next**.
- The screen **End-User License Agreement** is displayed:

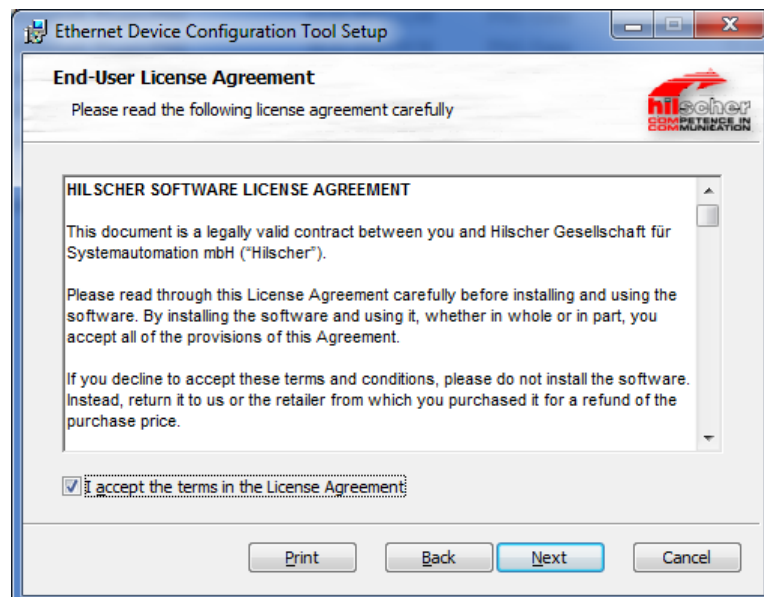


Figure 27: Ethernet Device Configuration Setup Wizard: Hilscher Software License Agreement

- Check **I accept terms in the License Agreement**.
- The screen **Ready to install Ethernet Device Configuration** is displayed:

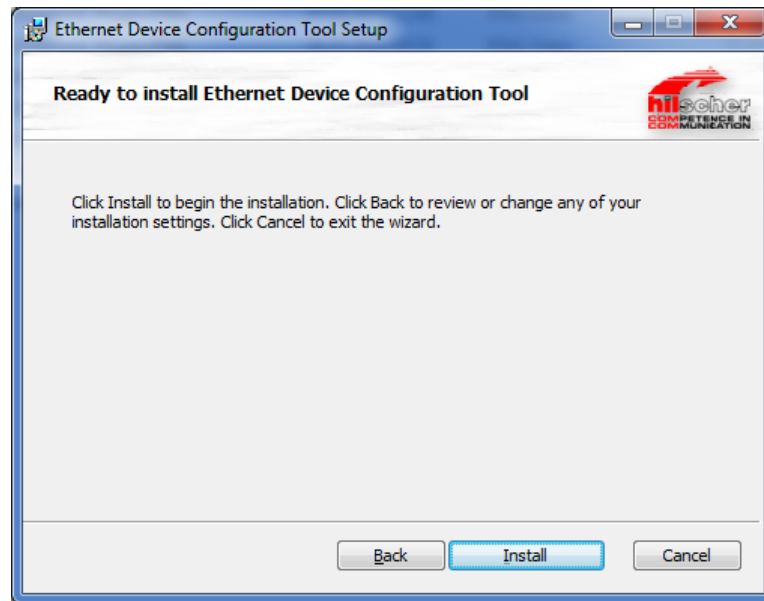


Figure 28: Ethernet Device Configuration Setup Wizard: Starting the Ethernet Device Configuration Installation

- The screen **Installing Ethernet Device Configuration** is displayed:

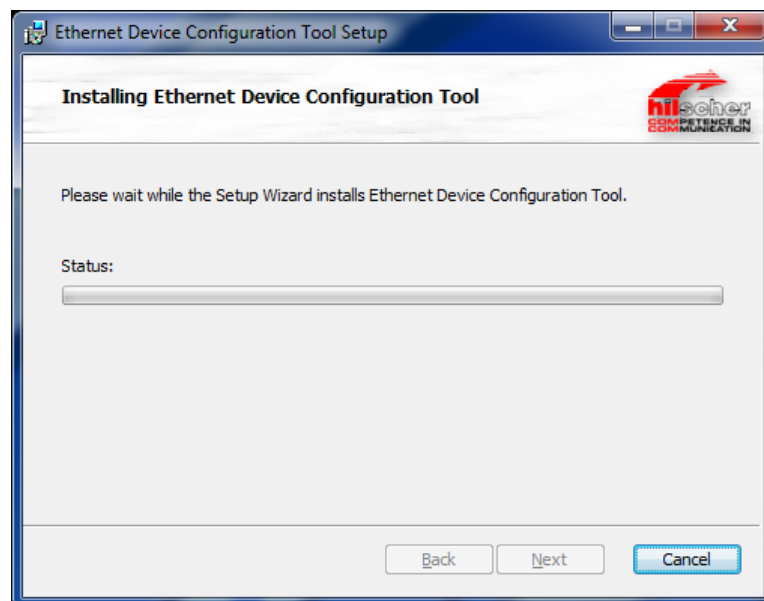


Figure 29: Ethernet Device Configuration Setup Wizard: Ethernet Device Configuration Installation

- The screen **Complete the Ethernet Device Configuration Setup Wizard** is displayed:



Figure 30: Ethernet Device Configuration Setup Wizard: Finish Ethernet Device Configuration Installation

- Close the Ethernet Device Configuration installation via **Finish**.
- The Ethernet Device Configuration installations complete.



For details refer to the *Operating Instruction Manual Ethernet Device Configuration, Address Setting for Ethernet capable Hilscher Devices*. You find this manual on the netANALYZER Installation DVD under **Documentation**.

6.3 Configuration of the IP Address (only NANL-B500G-RE)



Requirements: The IP address of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online.

The NANL-B500G-RE device can operate in three different modes:

- **Static IP Address** (*manual assignment*)
A fixed IP address is assigned to the analyzer device NANL-B500G-RE. The user must manually assign the IP address designated.
This option is used only in special cases.
- **DHCP Client Mode** (*external DHCP Server required*)
The IP address is assigned to the analyzer device NANL-B500G-RE. The device gets an IP address from the external DHCP server using the DHCP protocol. This IP address then automatically is assigned.
This option is used only in special cases.
- **DHCP Server Operation** (*device operates as DHCP server*)
As an DHCP server, the analyzer device NANL-B500G-RE assigns itself IP addresses to other devices.
This option is the default setting in the most common use case. The user must not make any configuration.



Important: The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices. Otherwise, it may lead to wrong assignment of IP addresses and malfunction. The analyzer device works by default as an external DHCP server in the **DHCP Server Operation** mode independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

For the data captured by the analyzer device NANL-B500G-RE and transmitted over an Ethernet connection to the PC arrive safely, you may use the analyzer device exclusively with a laptop or a PC with a separate network card.

DHCP Server Operation

Therefore you must set your LAN connection to (IP V4) **Automatically obtain IP address**.

Static IP Address or DHCP Client Operation

To use **Static IP Address** or **DHCP Client Mode**, you can configure your netANALYZER portable device NANL-B500G-RE using the **Ethernet Device Configuration** program.



For details refer to the *Operating Instruction Manual Ethernet Device Configuration, Address Setting for Ethernet capable Hilscher Devices*. You find this manual on the netANALYZER Installation DVD under **Documentation**.



Note: In case of problems due to incorrect settings of the IP address (e. g. device is not accessible), restart your device. While turning on your device press the REC button for about minute. Then the default setting for the IP address of your device (DHCP server mode) is restored.

6.4 Open Documentation or Examples

Via the autostart menu of the netANALYZER Installation DVD are also the documentation and programming examples for netANALYZER are available.

Open Documentations Directory

1. Enter the netANALYZER Installation DVD in the local DVD ROM drive.
➤ The start screen of the autostart menu is displayed:
2. Select **Open Documentations Directory** in the autostart menu.
➤ The folder **Documentation** is displayed:

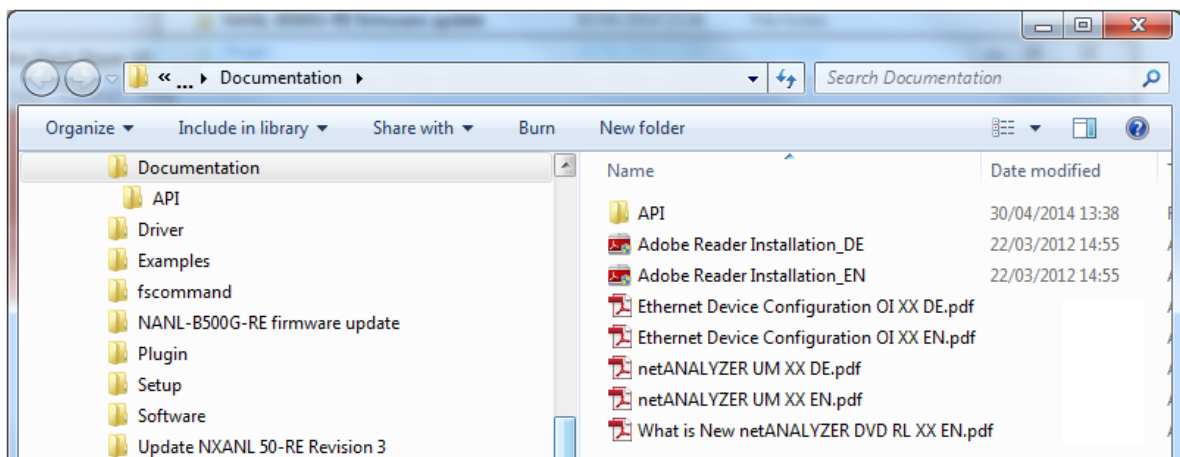


Figure 31: Folder „Documentation“ of the netANALYZER Installation DVD

- The folder **Documentation** contains:
- The user manual **netANALYZER**
 - The folder **API** with the **Driver Manual netANALYZER API, Windows XP/Vista/7/8, V1.x**

Refer also to section *Documentations netANALYZER* on page 12.

Or:

Open Application Examples Directory

3. Select **Open Application Examples Directory** in the autostart menu.
➤ The folder **Examples** is displayed with:
➤ 2 programming examples for the application programming interface (API) the analyzer card NANL-C500-RE and the analyzer device NANL-B500E-RE or NANL-B500G-RE.

6.5 Display and Settings in Wireshark

6.5.1 netANALYZER Info Block in extended .pcap File Format

In the extended .pcap file format according to the link-layer type with Wireshark 1.7.1 the compatible "netANALYZER frame info block" with the additional information is in the 4 bytes ahead of the Ethernet frame.

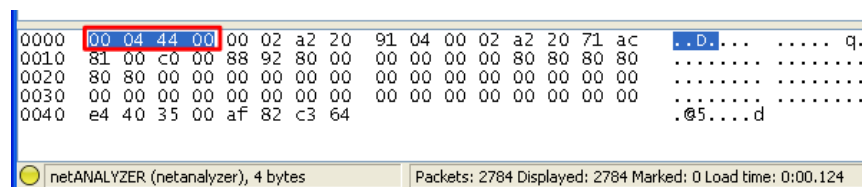


Figure 32: Wireshark 1.7.1: netANALYZER Info Block in the extended .pcap File Format



Beginning with version 1.4.x.x, the netANALYZER software converts the recorded data in either

- the .pcap file format with the info block behind the Ethernet frame or
- into the **extended link-layer type .pcap file format** with the info block ahead of the Ethernet frame.

For additional information refer to section *Converting Binary Files into WinPcap Format* page 109.

The extended .pcap file format generated by the netANALYZER software beginning from V1.4.x.x, can only be opened in Wireshark versions beginning from V1.7.1. When using earlier versions of Wireshark, the error message "link-layer type is not supported" is displayed.

For troubleshooting, you must either install the latest version of Wireshark or convert the .pcap file to the .pcap- file format with the info block behind the Ethernet frame. The .pcap file format with the info block behind the Ethernet frame, however, will no longer be supported by future versions of Wireshark.

Real Frame Length



Important: The 4 bytes additional information of the "netANALYZER Frame Info Block" ahead of the Ethernet frame are not included in the real frame length.

In the example in *Figure 32* 72 bytes have been captured, the real frame length in this example is 68 bytes, however.

6.5.2 Display Port Number in Wireshark Packet List

To display the port information in the protocol tree of Wireshark directly in the packet list of Wireshark, you can insert a new column to the packet list of Wireshark. Therefore proceed as follows:

- Select in Wireshark **Edit > Preferences**.

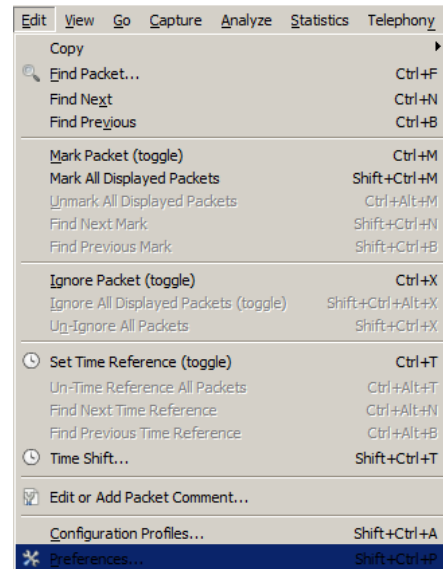


Figure 33: Wireshark: Edit > Preferences

- Select in the **Preferences** dialog at the left side **User Interfaces > Columns**.

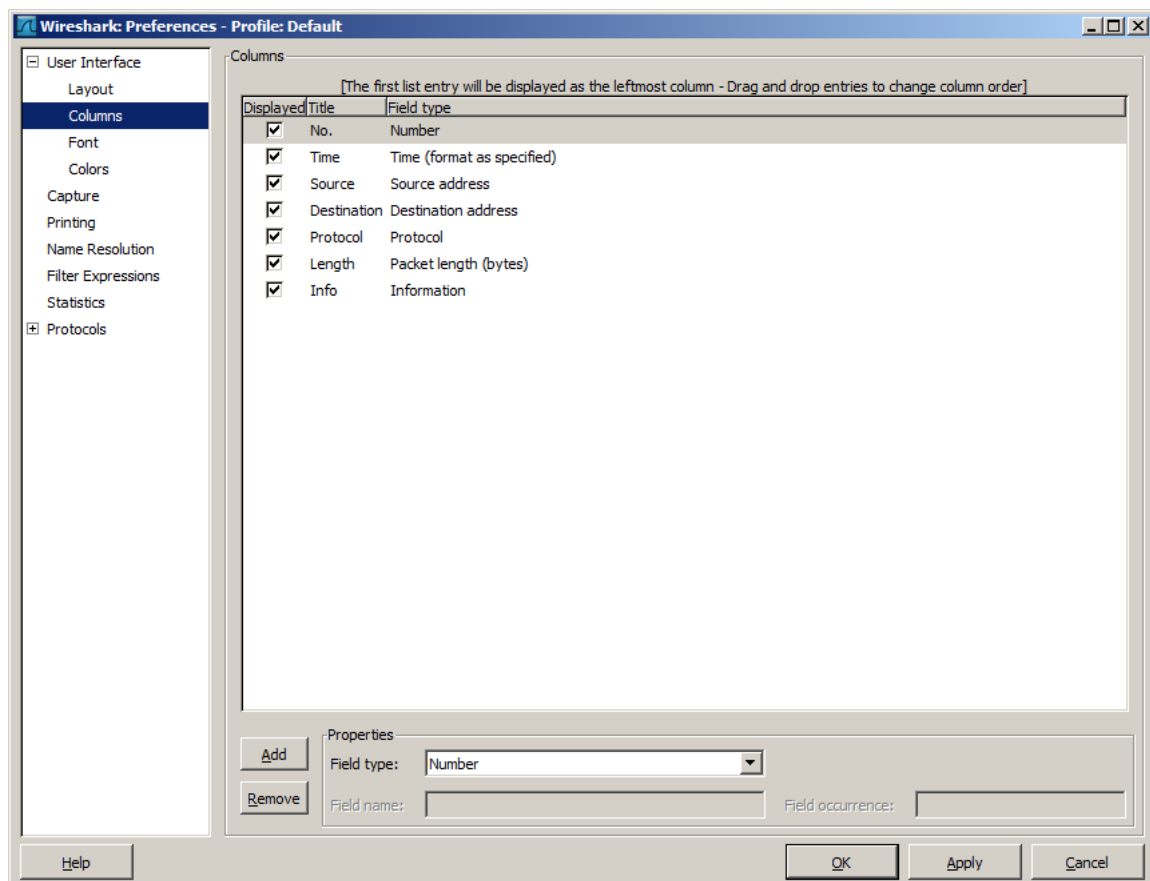


Figure 34: Wireshark: Preferences > User Interface > Columns

- Select under **Field Type** (1) „Custom“.
- Enter for the **Field name** (2) „netanalyzer.port“.
- Click to **Add**.
- The new line „New Column“ is displayed.

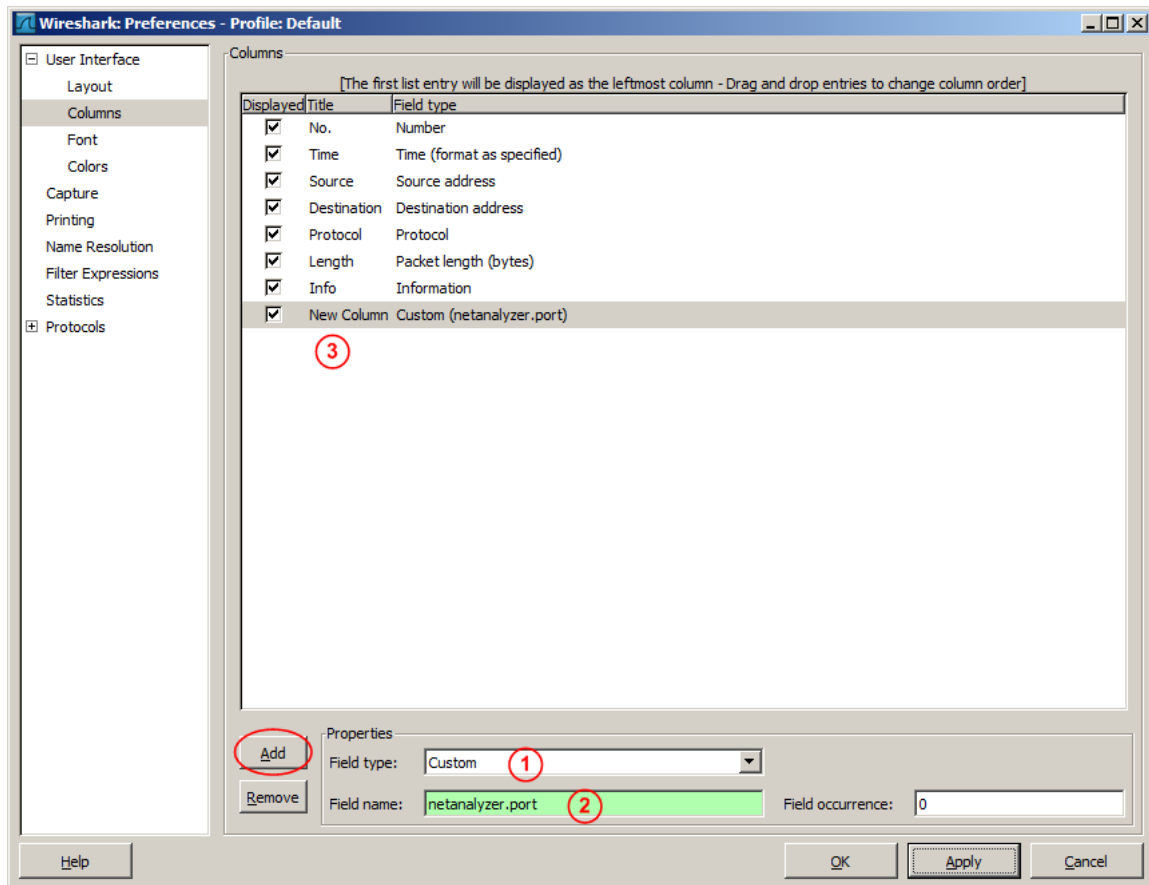


Figure 35: Wireshark: Preferences > User Interface > Columns > Add

- Enter at **Title** (3) the heading name “Port”.
- Move the line to the requested position.

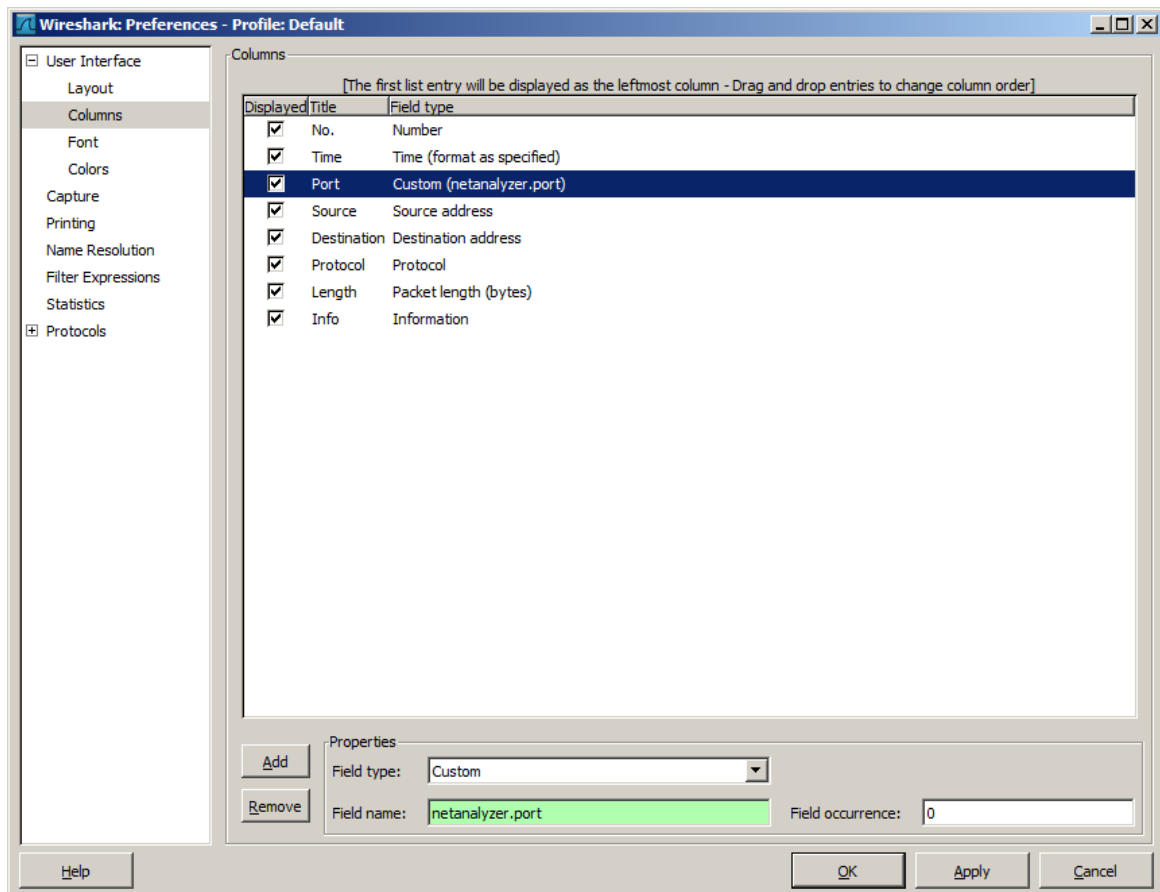


Figure 36: Wireshark: Preferences > User Interface > Columns

- Close the window via **OK**.
- In the packet list of Wireshark the number of the port now is displayed as an addition column.

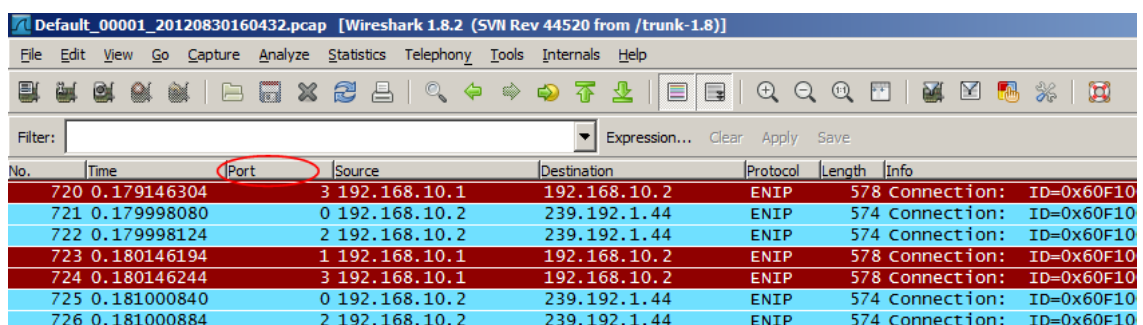


Figure 37: Wireshark: Port Number in the Packet List

7 netANALYZER Hardware Installation

To install the NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device handle as described in the sections hereafter.



For the installation of the netANALYZER device check any notes in the overview in chapter *Getting Started* on page 29.

7.1 Safety Messages on Personal Injury

Obey to the following safety messages on personal injury, when installing, uninstalling or replacing the NANL-C500-RE card.

7.1.1 Electrical Shock Hazard (NANL-C500-RE)

NANL-C500-RE card:



WARNING

Lethal Electrical Shock caused by parts with more than 50V!

- HAZARDOUS VOLTAGE inside of the PC or of the connecting device.
- Strictly obey to all safety rules provided by the device's manufacturer in the documentation!
- First disconnect the power plug of the PC or of the connecting device, before you open the cabinet.
- Make sure, that the power supply is off at the PC or at the connecting device.
- Open the PC cabinet and install or remove the NANL-C500-RE card only after disconnecting power.

7.2 Property Damage Messages

Obey to the following property damage messages, when installing the netANALYZER device (NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device).

7.2.1 Device Destruction by exceeding allowed Supply Voltage

NOTICE**Device Destruction!**

- Use only the permissible supply voltage to operate the netANALYZER device.
- Operating the netANALYZER device with a supply voltage above of the specified range leads to device destruction.

For detailed information on the supply voltage, refer to section *Power Supply and Host Interface* on page 26.

7.2.2 Device Destruction by exceeding allowed Signaling Voltage

NOTICE**Device Destruction!**

- All I/O signal pins at the netANALYZER device tolerate only the specified signaling voltage!
- Operating the netANALYZER device with a signaling voltage other than the specified signaling voltage may lead to severe damage to the netANALYZER device!

For detailed information on the signaling voltage, refer to section *Power Supply and Host Interface* on page 26.

7.2.3 Device Destruction by exceeding permissible External IO Interface Output Current

NOTICE**Device Destruction!**

- During operation of the NANL-C500-RE card and the NANL-B500E-RE or NANL-B500G-RE device the specified device specific maximum values for the output current at the external IO interface I/O signal pins must not be exceeded.
- The netX chip and other components of the NANL-C500-RE card and the NANL-B500E-RE or NANL-B500G-RE device can be damaged if the output current at the external IO interface I/O signal pins exceeds the maximum permissible value!

The data on the maximum permissible output current at the I/O signal pins for the devices described in this manual you find in the section *Maximum permissible Output Current (external IO Interface)* on page 27.

7.2.4 Damage of externally attached Hardware

NOTICE**Damage of externally attached Hardware**

NANL-C500-RE, NANL-B500E-RE

- If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected, check that the external device is suitable for the application.

NANL-B500G-RE

- If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.
 - If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.
 - Before an external device is connected, check whether the value for the voltage set in the netANALYZER software is correct. Furthermore, check whether the external device is suitable for the application.
-

7.2.5 Electrostatically sensitive Devices (NANL-C500-RE)

NANL-C500-RE card:

Adhere to the necessary safety precautions for components that are vulnerable with electrostatic discharge.



NOTICE**Electrostatically sensitive Devices**

To prevent damage to the PC and the NANL-C500-RE, make sure:

- that the NANL-C500-RE card is grounded via the endplate and the PC and make sure,
 - that you are discharged when you mount/demount the NANL-C500-RE card.
-

7.2.6 Assignment of wrong IP addresses, malfunction (NANL-B500G-RE)



Important: The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in **DHCP Server Operation** mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

The analyzer device NANL-B500G-RE works by default as an external DHCP server in the **DHCP Server Operation** mode independently and assigns IP addresses to other devices. This may happen also to devices which are not concerned by the netANALYZER measurements.

In order to connect the analyzer device NANL-B500G-RE to any network ensure that **DHCP Server Operation** mode is disabled.

7.3 Mounting Analyzer Card NANL-C500-RE to the PC



Note: The installation sequence must be obeyed.

1. Install software from DVD

2. Mount NANL-C500-RE card

Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For mounting the analyzer card NANL-C500-RE to the PC handle as follows:

1. Take safety precautions.

WARNING

Lethal Electrical Shock caused by parts with more than 50V!

- Disconnect the power plug of the PC or of the connecting device.
- Make sure, that the power supply is off at the PC or at the connecting device.

NOTICE

Electrostatically sensitive Devices

- Make sure, that the NANL-C500-RE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/uninstall the NANL-C500-RE card.

NOTICE

Device Destruction!

- Use exclusively 3.3 V for supply voltage to operate the NANL-C500-RE card. Operation with 5 V supply voltage leads to device destruction.
 - At the I/O signal pins of the PCI bus use exclusively 5 V or 3.3 V signaling voltage and at the I/O signal pins of the External IO interface use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card!
2. Open the cabinet of the PC.
 3. Plug in the analyzer card NANL-C500-RE on a free PCI slot.
 4. Fix the slot plate of analyzer card NANL-C500-RE to the slot plate of the PC by using a screw.
 5. Close the PC casing.
 6. Connect the PC to the power supply and switch on the PC.

7.4 Connecting Analyzer Device NANL-B500E-RE to the Notebook



Note: The installation sequence:

1. Install software from DVD

2. Mount NANL-B500E-RE device

must be obeyed. Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For connecting the analyzer device NANL-B500E-RE to the Notebook handle as follows:

1. Take precautions.

NOTICE

Device Destruction!

- The voltage applied at the NANL-B500E-RE device must not exceed 30 V, otherwise the device may be destroyed.
 - Connect only one 24 V DC power supply to the device. If the device is connected to both power connectors (0V/+24V/PE and +24V) simultaneously, this may lead to damage to the used power supply units!
 - At the ExpressCard use exclusively a PCIe compatible signaling voltage and at the I/O signal pins of the External IO interface use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500E-RE device!
2. Plug in the ExpressCard of the analyzer device NANL-B500E-RE to a free ExpressCard slot at the Notebook.
 3. Connect the analyzer device NANL-B500E-RE to an external 24V power supply.

7.5 Connecting Analyzer Device NANL-B500G-RE to the PC



Note: The installation sequence:

1. Install software from DVD

2. Mount NANL-B500G-RE device

must be obeyed. Otherwise, there will be incorrect registry entries. This in turn leads to disturbances in subsequent installation of software updates.

For connecting the analyzer device NANL-B500G-RE to the PC handle as follows:

1. Take precautions.

NOTICE

Device Destruction!

- The voltage applied at the NANL-B500G-RE device must not exceed 30 V, otherwise the device may be destroyed.
- At the I/O signal pins of the External IO interface use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!

2. Establishing an Ethernet connection from the analyzer device NANL-B500G-RE to the PC.



Note: The Ethernet connection from the analyzer device NANL-B500G-RE to the PC is a saved connection without loss. Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, too strong interference can lead to a disconnection.

- Connect the Ethernet cable to the Gigabit RJ45 Ethernet socket **UPLINK 1 Gb/s** at the reverse side of the device.
 - Connect the Ethernet cable to the RJ45 Ethernet socket (1 Gb/s) at the separate network card within the PC.
3. Connect the analyzer device NANL-B500G-RE to an external 24V power supply.



Important! The color of both LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

7.6 Inserting netANALYZER Hardware into the Communication Link



Important: The analyzer device NANL-B500G-RE must not be inserted via a switch or hub directly into a corporate network with other devices, as long as the analyzer device is operating in **DHCP Server Operation** mode. Otherwise, it may lead to wrong assignment of IP addresses and malfunction.

Connect the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via two patch cables with the Ethernet device connections, in parallel to the communication connection to be analyzed. Basically, different assemblies are possible.



Notes:

- (1) To analyze the data transfer of a communication line between two devices, these devices must be connected to the same TAP (Test Application Point).
- (2) The RJ45 socket is only for use in LAN, not for telecommunication circuits.

In the following subsections typical application cases are described.

7.6.1 Application Case 1

Capturing and analyzing the Communication between two Devices

- To capture the communication between two Ethernet devices, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE over Ethernet cables as displayed in the picture below.
- Connect both Ethernet cable only in TAP A (or in TAP B).

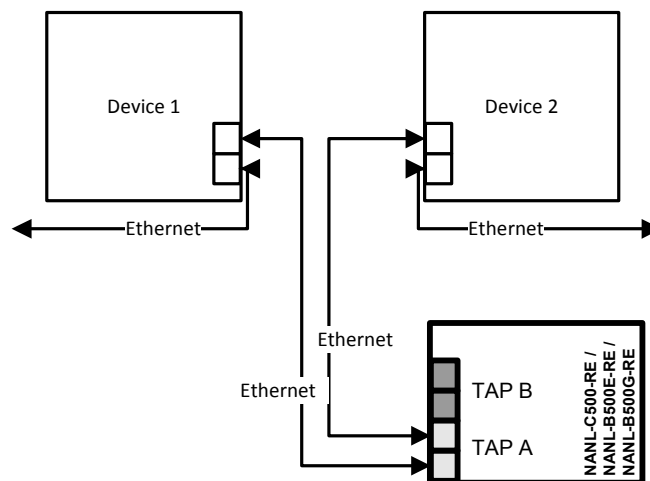


Figure 38: Application Case1

Furthermore, it analyzes the number of erroneous messages.

A forwarding time of telegrams by a device can not be determined. See *Application Case 2*.

7.6.2 Application Case 2

Application Case 2 is the typical Application Case

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication between two devices each for two channels each,
- the forwarding time through the device,
- the cycle time and the jitter in the cyclically running protocols,
- the changes of the data in the Ethernet frame through the device,
- the number of erroneous telegrams.

- To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via Ethernet cables as shown in the picture.

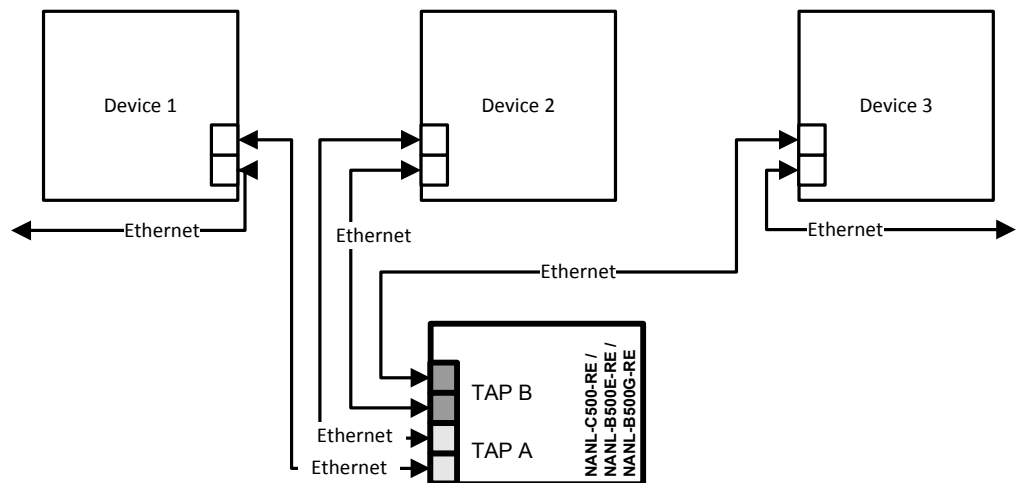


Figure 39: Application Case2

7.6.3 Application Case 3

Like Application Case 2, but with further Devices

This use case corresponds to the application case 2, but with the difference that further devices are between the two analyzed Ethernet channels.

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication for two channels,
 - the forwarding time through several devices,
 - the cycle time and the jitter in the cyclically running protocols,
 - the changes of the data in the Ethernet frame through several devices,
 - the number of erroneous telegrams.
- To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE via Ethernet cables as shown in the picture.

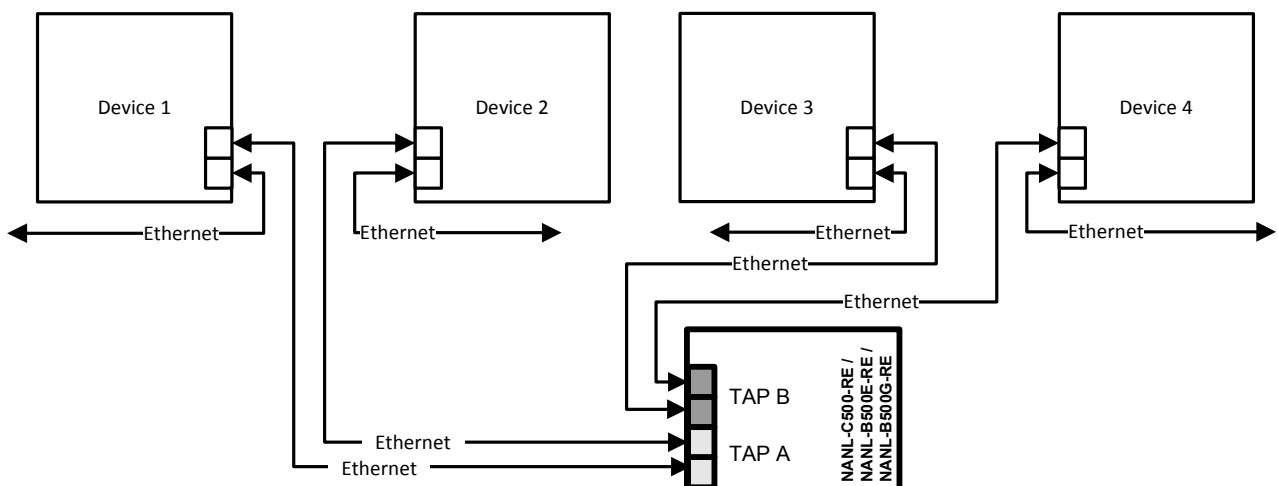


Figure 40: Application Case3

7.6.4 Application Case 4

Like Application Case 2, but with Analysis of Input Signals

This use case corresponds to the application case 2, but in addition to the Ethernet communication one to four input signals are included in the analysis. If an edge reversal at the digital input happens, a pseudo Ethernet frame with timestamp is created in the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE.

In this case the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE can analyze the following procedures and parameters:

- the communication between two devices for two channels,
- the forwarding time through the device,
- the cycle time and the jitter in the cyclically running protocols,
- the changes of the data in the Ethernet frame through the device,
- protocol-stack processing time from Ethernet frame reception to digital output switching,
- the input signal events on the basis of time-stamps,
- the number of erroneous telegrams.

NOTICE

Device Destruction!

- At the I/O signal pins of the External IO interface use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card or the NANL-B500E-RE device!
- At the I/O signal pins of the external IO interface use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-C500-RE card or the NANL-B500E-RE device use maximally 10 mA output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.
- To operate the the NANL-B500G-RE device use maximally 1 mA (bei 3,3V) or 600 mA (bei 24V) output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.

NOTICE**Damage of externally attached Hardware**

NANL-C500-RE, NANL-B500E-RE

- If the +3.3V output of the external IO interface is enabled, externally attached hardware could be damaged as voltage is driven.
- Before an external device is connected, check that the external device is suitable for the application.

NANL-B500G-RE

- If the +3.3V output of the external IO interface is enabled (IO status LED lights up orange), externally attached hardware could be damaged as voltage is driven.
 - If the +24V output of the external IO interface is enabled (IO status LED lights up red), externally attached hardware could be damaged as voltage is driven.
 - Before an external device is connected, check whether the value for the voltage set in the netANALYZER software is correct. Furthermore, check whether the external device is suitable for the application.
- To capture the communication of the two channels, mount the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE via Ethernet cables as shown in the picture.

The picture also shows schematically how a digital output signal is connected from the device to the digital input of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE.

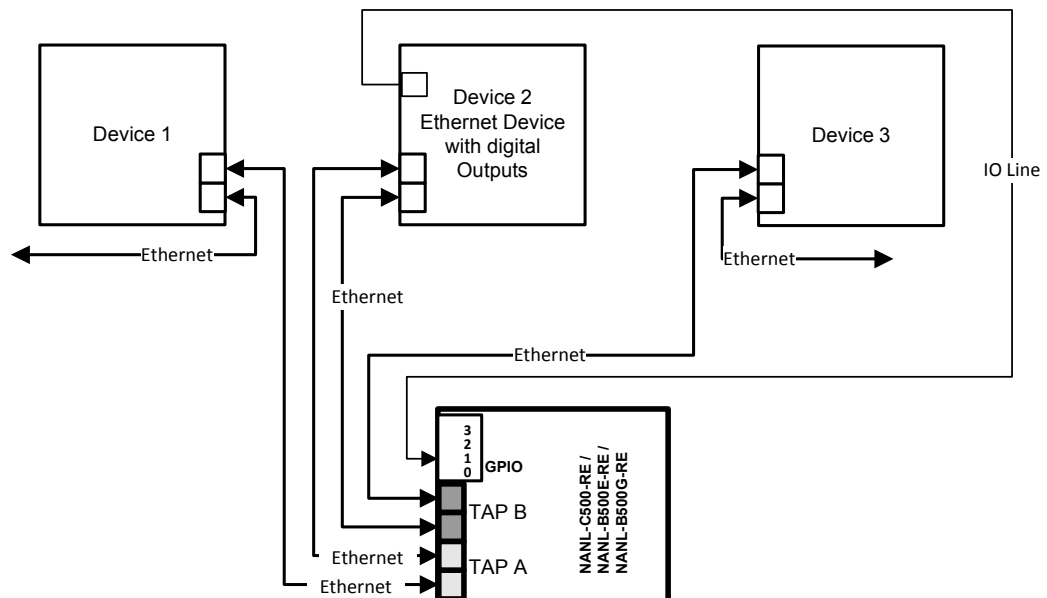


Figure 41: Application Case4 – Recording of the Runtime in the Device

7.7 Auto-Crossover and Port-Switching

In a system with for example one netANALYZER device and two RTE devices, the assignment of port 0 and port 1 or port 2 and port 3 can change between different test runs. This is due to the auto-crossover feature of most RTE systems. For auto-crossover the cable assignment by the devices is given randomly. The assignment of the lines as a "transmission line" or "receiving line" is random.

Example

Device 1	Device 2	
PROFINET IO	PROFINET IO	
_____ netANALYZER Device _____		
	1. Measurement	2. Measurement
Line A on Port 0	"Transmission Line"	"Receiving Line"
Line B on Port 1	"Receiving Line"	"Transmission Line"

Figure 42: Example - Auto-Crossover and Port-Switching

At the 2nd Measurement in this example the receipt of the telegrams is wrong. The port numbers in the telegrams were exchanged.

If both devices use auto-crossover, there is the possibility that port 0 and port 1 will be exchanged for subsequent measurements. This is also true for port 2 and port 3.

Schematic Design of a TAP

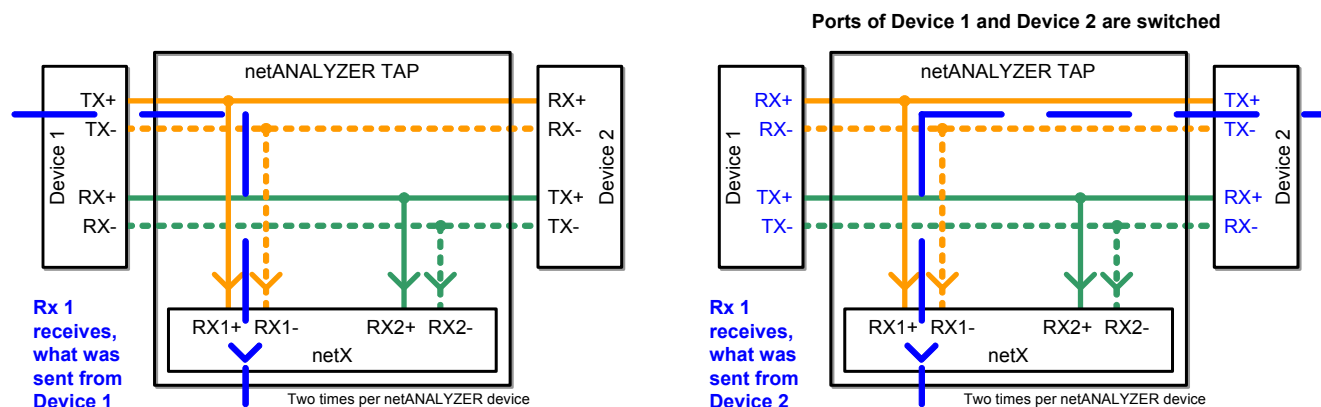


Figure 43: Design of a TAP, at the right Side Ports of Device 1 and Device 2 exchanged

The schematic design of a TAP shown in Figure 43 makes evident which effects an interchange of the lines of the two devices has.

Workaround

A workaround is possible, by drawing conclusions from the records of two consecutive test runs. In the records for the second test run compared with the first test run, modified port numbers can be found.

7.8 How to update the NANL-B500G-RE Firmware



Requirements: The IP address of the analyzer device NANL-B500G-RE must be configured according to section *Configuration of the IP Address (only NANL-B500G-RE)* on page 54. The IP address of the device and the IP address of the PC must be in the same network respectively the DHCP server must be online.

Steps

1. Open the **Ethernet Device Configuration** program.
2. Scan for devices.
- Your analyzer device NANL-B500G-RE is displayed.

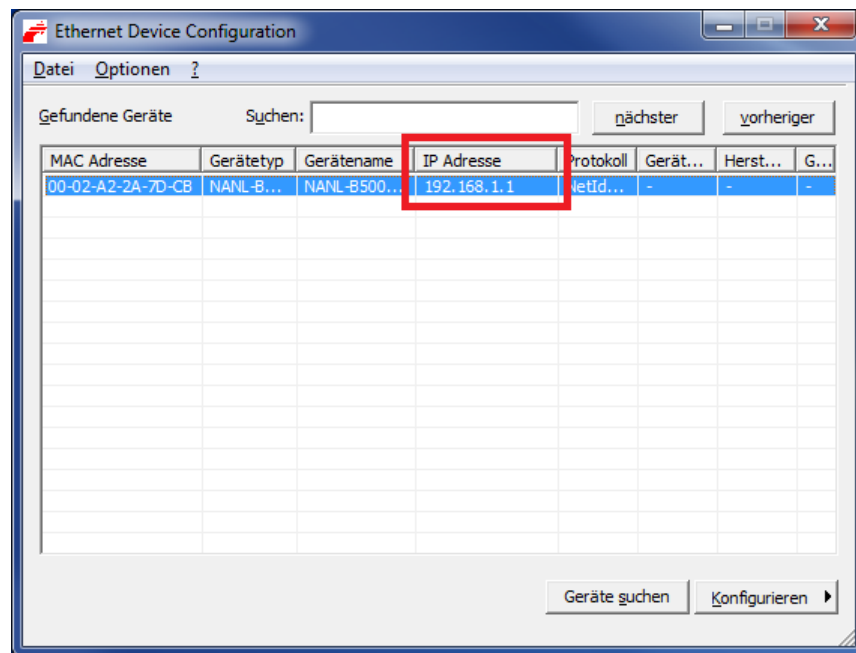


Figure 44: Ethernet Device Configuration - NANL-B500G-RE found (Example)

3. Obtain the IP address of your NANL-B500G-RE device the firmware of which you want to update. For the example shown in the figure above the obtained IP address is *192.168.1.1*.



For details to the **Ethernet Device Configuration** program refer to the *Operating Instruction Manual Ethernet Device Configuration, Address Setting for Ethernet capable Hilscher Devices*.

4. Open the Windows explorer.
5. Enter the IP address obtained from step 3 to the address bar of the Windows explorer as follows: **ftp://[IP adresse]**.

Alternatively you can use a common FTP utility. Then only enter the IP address *[IP adresse]*.

- The Windows explorer **Log On As** screen appears.

- On the Windows explorer **Log On As** screen enter "update" as user name and "nanl-b500g-re" as password (without the double quotes).

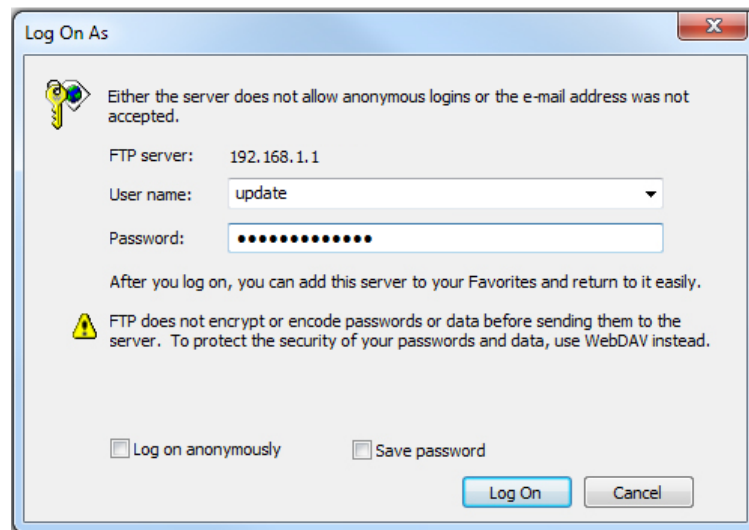


Figure 45: FTP Server Log On Screen

➤ The the netANALYZER FTP server directory opens.

- Copy the incremental firmware update file *nanl-b500g-re.update* to the netANALYZER FTP server directory.

The firmware update file can be found on the netANALYZER DVD in the diectory *NANL-B500G-RE firmware update*.

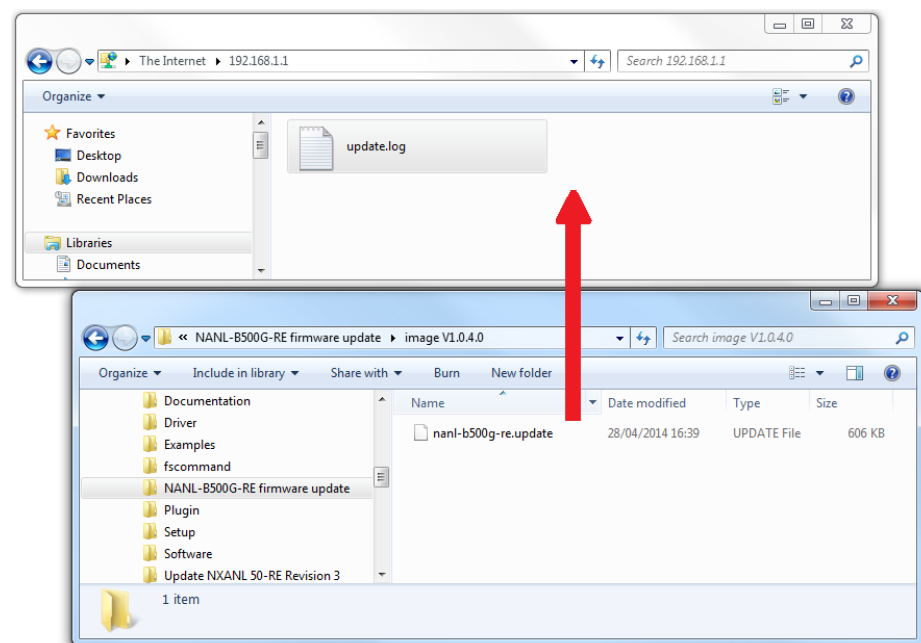


Figure 46: Copy the Firmware update File to the netANALYZER FTP Server Directory.

- Once the file is copied the FTP Server directory should contain the file *nanl-b500g-re.update*.

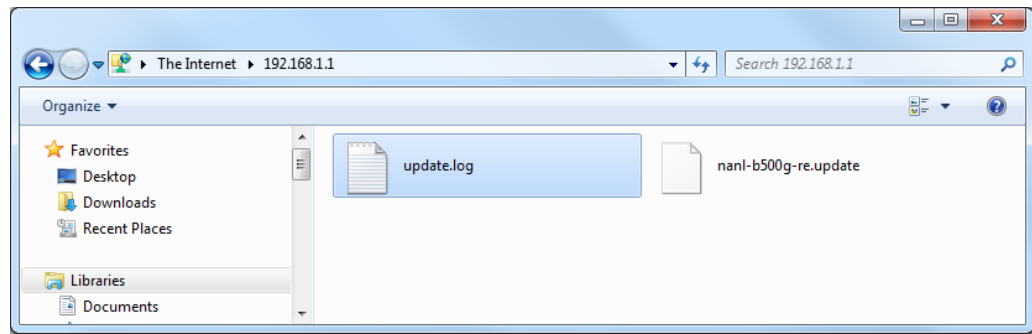


Figure 47: netANALYZER FTP Server Directory containing the Firmware update File

There may exist a file *update.log* from a previous update process, the log file can be ignored.

8. Power off your NANL-B500G-RE device.
 9. Power on your NANL-B500G-RE device and wait until the device is fully operational (SYS LED = green, STA0 LED = red, STA1 LED = off).
- Your device is now updated.

10. To verify if the update process was successfully, verify the version information.

- Open the netANALYZER software and select your device. See also in section *Selecting netANALYZER Device* on page 80.

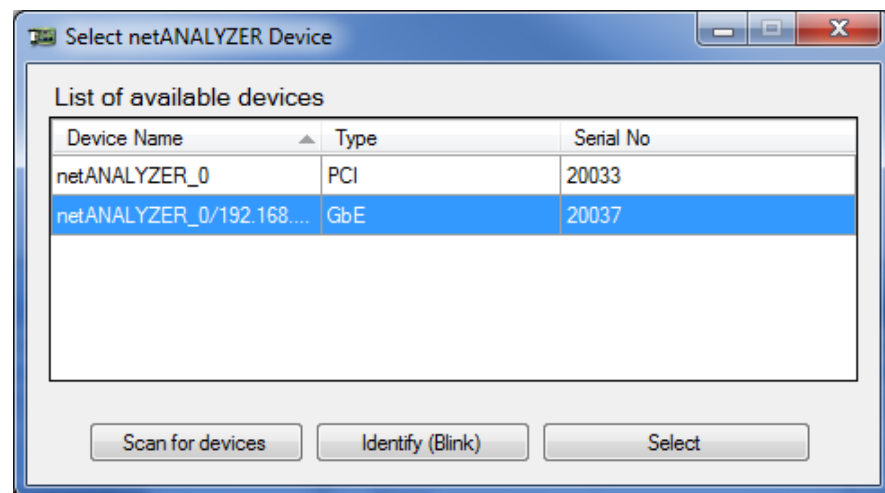


Figure 48: Select Analyzer Device NANL-B500G-RE

- The netANALYZER main window opens.

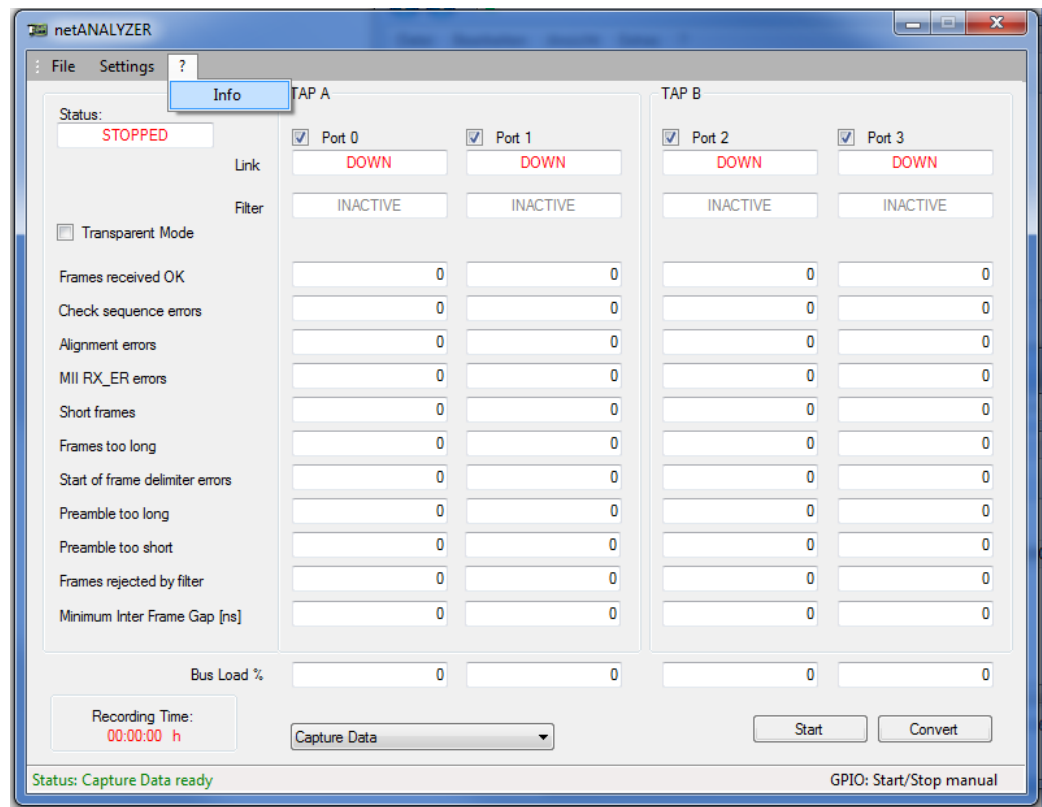


Figure 49: netANALYZER Main Window > Info Menu

- Via ? > Info open the **About Hilscher netANALYZER** dialog box.

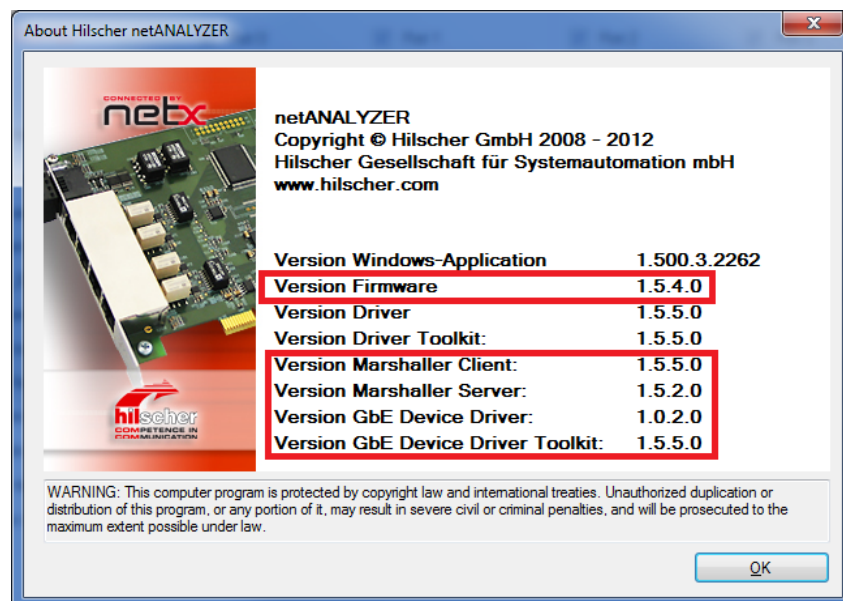


Figure 50: About Hilscher netANALYZER Dialog Box with Version Information

- The firmware version, the versions of the remote access Windows client as well as of the device driver for your NANL-B500G-RE device should now be on the new state.

7.9 Demounting Analyzer Card NANL-C500-RE

For demounting the analyzer card NANL-C500-RE out of the PC handle as follows:

1. Take safety precautions.

WARNING

Lethal Electrical Shock caused by parts with more than 50V!

- Disconnect the power plug of the PC or of the connecting device.
- Make sure, that the power supply is off at the PC or at the connecting device.

NOTICE

Electrostatically sensitive Devices

- Make sure, that the NANL-C500-RE card is grounded via the endplate and the PC and make sure, that you are discharged when you install/uninstall the NANL-C500-RE card.
2. Open the cabinet of the PC.
 3. Pull out the male connector of the IO cable from the female connector of the external IO interface, see device drawing *Figure 4: Top Side and Front Plate Analyzer Card NANL-C500-RE* on page 35.
 4. Loosen the screws the analyzer card NANL-C500-RE card is fixed with.
 5. Take the NANL-C500-RE card from the PCI slot.
 6. Close the PC casing.

8 netANALYZER Software

The **netANALYZER** software is a Windows® application that indicates the status information about the hardware and the received data packets. In addition, here the operator must define the filing paths for capturing the analysis data and initiate the conversion of the stored binary files (*.hea) to the WinPcap format (*.pcap).

8.1 Starting the netANALYZER Software

8.1.1 Starting and closing the netANALYZER Software

- Starting the **netANALYZER** Software:
 - Select via the Windows® start menu **Start > Programs > Hilscher GmbH > Hilscher netANALYZER**.
- Closing the **netANALYZER** Software:
 - Select via the **netANALYZER** Software menu **File > Close**.

8.1.2 Starting the netANALYZER Software multiple Times

Beginning with the **netANALYZER** software version 1.4.x.x the **netANALYZER** user interface includes multi-instance capability and can be opened multiple times in parallel. If you have two or more **netANALYZER** devices connected to your PC you will be able to run the **netANALYZER** software for each device at the same time.



Note: All settings such as HEA file settings, filter settings, etc. are stored for each **netANALYZER** device under a separate registry value. This allows keeping all device specific settings when using multiple **netANALYZER** devices in parallel.

8.1.3 Verification for Hardware and Device Driver

During initializing of the **netANALYZER** software the **netANALYZER** hardware is checked and the **netANALYZER** / **netSCOPE** Device Driver version is verified.

- If the hardware is not installed, the window **Select netANALYZER Device** is displayed without a device. If you click to **Proceed without device**, the error message **Incompatible driver version** is displayed. Via **OK** the **netANALYZER** main window is displayed, with the status bar message „Error in driver“.
- If the **netANALYZER** / **netSCOPE** Device Driver or the **netANALYZER** software is not up to date and compatible, the following error message is displayed: **Incompatible driver version. Please check driver version and installation**.
 - Install the current **netANALYZER** software and the current **netANALYZER** / **netSCOPE** Device Driver.

8.1.4 Starting netANALYZER Software without Hardware Installation

If you have not installed any netANALYZER hardware in your PC, you can start netANALYZER software anyway, for example, to convert binary files to the WinPcap format or to create extended software filters.

Procedure:

- Open the netANALYZER software via **Start > Programs > Hilscher GmbH > Hilscher netANALYZER**.
- The **Select netANALYZER Device** window without a device.

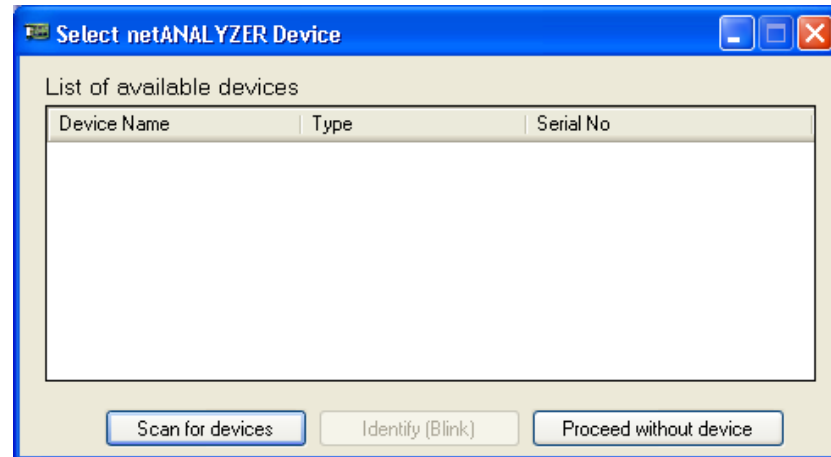


Figure 51: Proceed without Device

- Click on **Proceed without device**.
- The error message **Missing or incorrect driver** appears:

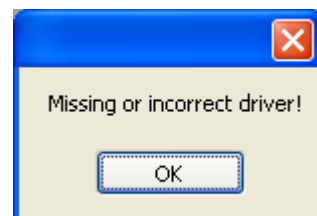


Figure 52: Missing or incorrect Driver

- Click on **OK**.
- The **netANALYZER** main window is displayed, with the status bar message „Error in driver“.

About **Settings** and **Convert** you can access to all dialogs important for the conversion or the presets. The Filter Settings dialog can not be opened.

8.1.5 Selecting netANALYZER Device

Beginning with the netANALYZER software version 1.4.x.x after the error free start of the software the **Select netANALYZER Device** window is displayed, with the list of available netANALYZER devices.

To select a device:



Note: The netANALYZER device must be connected via an Ethernet connection to the PC or notebook.

- Open **Start > Programs > Hilscher GmbH > Hilscher netANALYZER**.
- The window **Select netANALYZER Device** is displayed. The found netANALYZER devices are listed in the window.

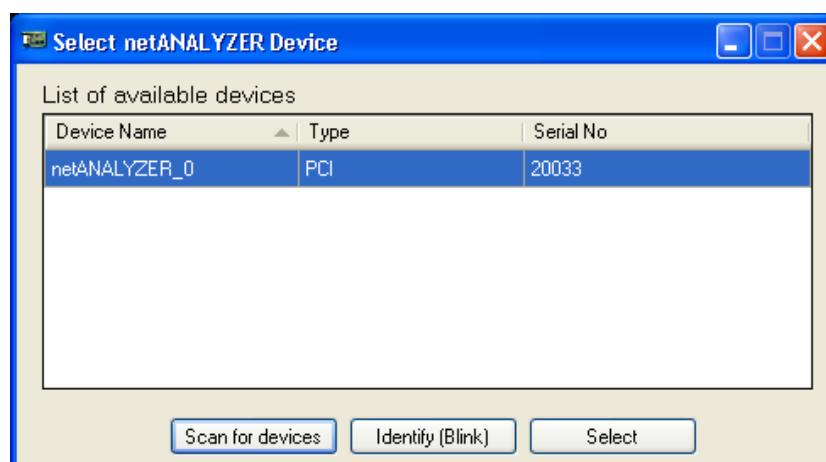


Figure 53: Select netANALYZER Device (Example NANL-C500-RE)



Figure 54: Select netANALYZER Device (Example NANL-B500G-RE)

Control	Explanation	Range of Value / Value
Device Name	Name of the found netANALYZER device	netANALYZER_0, netANALYZER_1 ...
Type	Type of netANALYZER device found	PCI, ExpressCard
Serial No	Serial number of the found netANALYZER device	
Scan for devices	Starting device search: The List of available devices shows the detected netANALYZER PCI devices or netANALYZER devices with ExpressCard.	

Control	Explanation	Range of Value / Value
Identify (Blink)	Starting device detection: The LEDs STA0 and STA1 on the selected device are flashing for approximately 10 seconds in green.	
Select	Select netANALYZER device for the current analysis. Already selected devices appear grayed out and can not be chosen again at the same time.	

Table 21: Description Select netANALYZER Device

- Select a netANALYZER device.
- Click on **Select**.
- The netANALYZER main window is displayed.

8.1.6 Scanning for changed netANALYZER Hardware Installation

When the hardware installation has been changed, you must restart the netANALYZER software, and scan for new devices.

➤ Therefore open **Start > Programs > Hilscher GmbH > Hilscher netANALYZER**.

➤ The window **Select netANALYZER Device** is displayed:

➤ Click to **Scan for devices**.

➤ The found netANALYZER devices are listed.



Note: Already selected devices appear grayed out and can not be chosen again at the same time.

➤ Select a netANALYZER device.

➤ Click on **Select**.

➤ The progress bar **Scanning for Devices*** displays the scanning progress in percent (when several netANALYZER devices are connected to the PC). [*for future use]

➤ In the **Select netANALYZER Device** window the found devices are displayed.

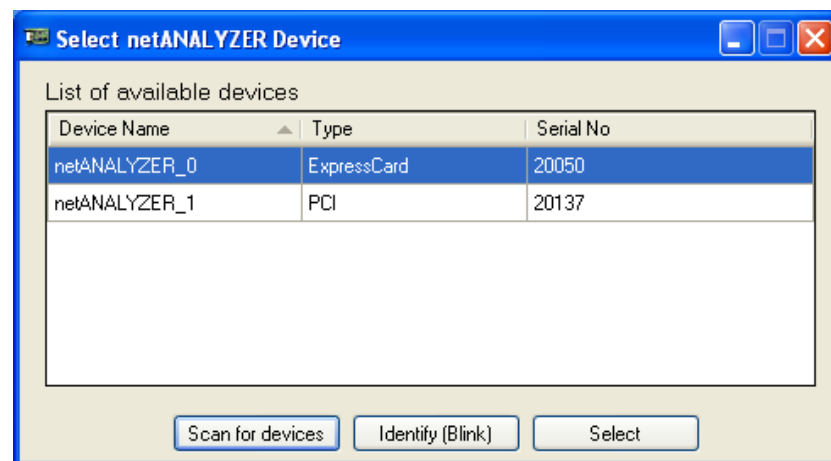


Figure 55: Select netANALYZER Device after Device Scan

➤ The netANALYZER main window is displayed.

8.2 netANALYZER Main Window

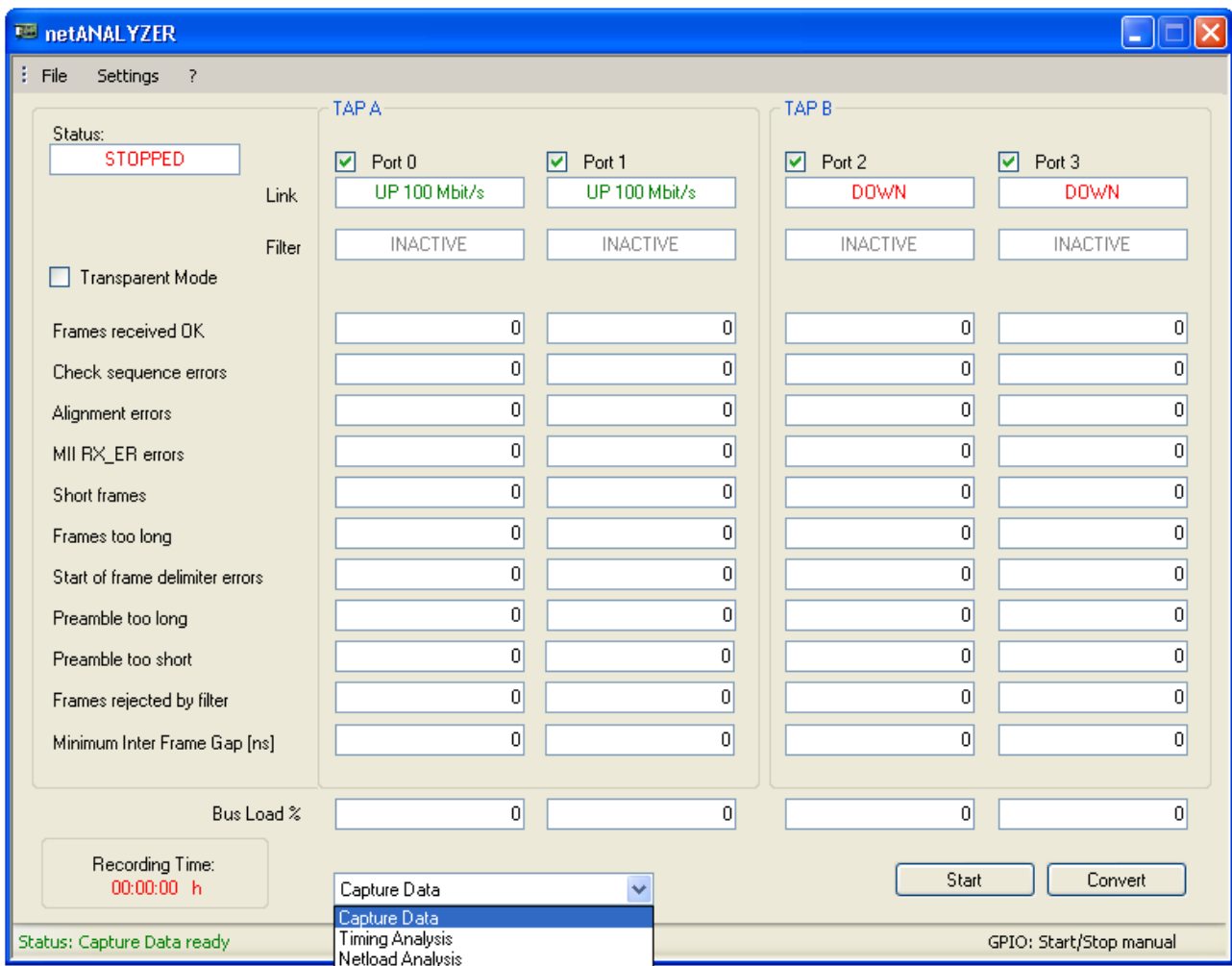


Figure 56: netANALYZER Main Window

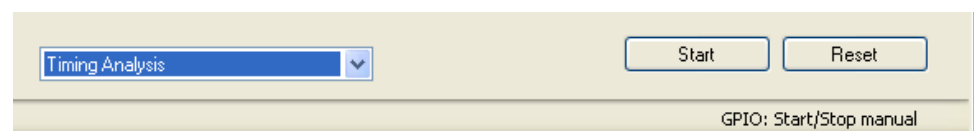
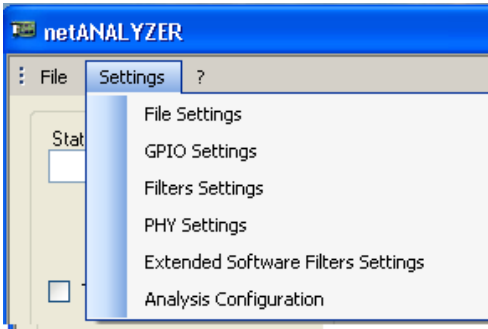


Figure 57: netANALYZER Main Window – Selection Timing Analysis

In the netANALYZER main window, you can for example

- set the **Ports** to be used for the capturing and
- which **Analysis Methods** are to be used,
- you can read here the data about the receive frames, the found errors, the bus load and for the capturing time,
- you can open the window to convert a binary format files into the WinPcap format and
- read the status bar reports on the status of the application, the firmware or the driver and of the GPIOs (external inputs/outputs).

Parameter	Meaning	Range of Value / Value
Settings Menu	 About the Settings menu you can open the windows for the settings and configuration. Further information you find in the subsequent sections.	
Status	Defines the operating status of the firmware	RUN / STOPPED
TAP A (Port 0, Port 1), TAP B (Port 2, Port 3)	Capturing for this port on/off. Deactivated ports are greyed out.	Selected/ unselected
Link	Indicates for each Port 0 to Port 3 the status of the link connected to the port and the speed information. "fix" indicates, that the speed has been set manually. For further information refer to section <i>Link Speed Information</i> on page 86.	UP / DOWN , 10, 100 MBit/s, fix 10, 100 MBit/s
Filter	Indicates for each Port 0 to Port 3 the status of the filter. If the syntax "ACTIVE" is displayed in red, the filter would be used but not stored so that the filter would be lost after a restart of the software.	ACTIVE, INACTIVE
Transparent Mode	If checked, any telegram data, including the preamble and SFD are displayed or captured. For further information refer to section <i>Transparent Mode</i> on page 115.	checked / unchecked, Default: unchecked
Frames received OK	Number of frames without error received	0 to 2 ^{^32} -1
Check sequence errors	Number of Sequence errors occurred	0 to 2 ^{^32} -1
Alignment Errors	Number of alignment errors by collision, frame is not Byte-Align	0 to 2 ^{^32} -1
MII RX_ER errors	Number of MII RX_ER errors	0 to 2 ^{^32} -1
Short frames	Number of short frames	0 to 2 ^{^32} -1
Frames too long	Number of frames too long	0 to 2 ^{^32} -1
Start of frame delimiter errors	Number of SFD errors	0 to 2 ^{^32} -1
Preamble too long	Preamble is too long	0 to 2 ^{^32} -1
Preamble too short	Preamble is too short	0 to 2 ^{^32} -1
Frames rejected by filter	Number of frames rejected by the filter	0 to 2 ^{^32} -1
Minimum Inter Frame Gap [ns]	Minimum measurable gap between two telegrams on the line	0 to 327670 ns
Bus Load %	Busload in percentage Note: For NANL-C500-RE TAP B the PHY transmission rate can not be evaluated. For this reason, here the busload signal 10 Mbit/s is faulty. But if in the PHY configuration dialog* the setting is changed to 10 Mbit/s manually (*see section <i>PHY Settings</i> on page 95), the busload signal can be displayed correctly. This is not true for NANL-B500E-RE or NANL-B500G-RE. Here everything automatically is displayed correctly.	0 – 100%
Recording Time	Recording Time, in „hours.minutes.seconds“	00.00.00 h

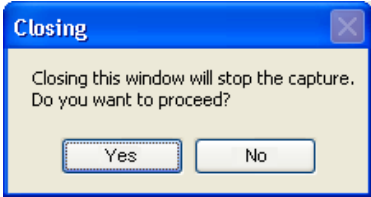
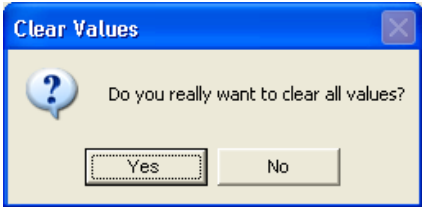
Parameter	Meaning	Range of Value / Value
Analysis Mode	Selection list Capture Data, Timing Analysis or Netload Analysis. For the selection Timing Analysis the Timing analysis window is displayed and for the selection Netload Analysis the Netload Analysis window is displayed. For further information refer to the sections <i>Data Capturing</i> page 108, <i>Timing Analysis</i> page 116 and <i>Netload Analysis</i> page 128.	Capture Data, Timing Analysis, Netload Analysis
Closing the Analysis Window	The respective analysis window is closed automatically if you select an other analysis mode in the netANALYZER main window. If you select  to close the analysis window, the query Closing this window will Stop the capture. Do you want to proceed? will be displayed. To cancel the analysis and the data capturing, click to Yes. 	
Start / Stop	For the selection ,Capturing': Starting and stopping Data Capturing, see section <i>Starting Data Capturing</i> on page 108. For the selection ,Timing Analysis' or ,Netload Analysis': Starting and stopping Analysis.	
Convert	For the selection ,Capturing' or ,Netload Analysis': Converting Binary Files into WinPcap Format, see section <i>Converting Binary Files into WinPcap Format</i> on page 109. Set storage path for the binary and Pcap files in the Path of .hea file and .pcap files window.	
Reset	For the selection ,Timing Analysis': Resets the analysis data within the four windows.  The query Do you really want to clear all values? is displayed. To reset the values, answer the query by yes.	
Status Bar	In the status bar of the main window of the netANALYZER software different status messages are displayed for the status of the application, for the firmware or for the driver or for the status of the GPIOs (external inputs/outputs) and for the used filter. Status: Indicates the Status of the application, of the firmware or of the driver: GPIO: Indicates the status of the GPIOs (external inputs/outputs). To read detailed explanations to the single status bar messages refer to section <i>Status Bar Messages</i> on page 135.	Status or GPIO messages

Table 22: Main Window: Parameters and Status Bar

8.3 Link Speed Information

Under **Link** for Port 0, Port 1, Port 2 and Port 3 the link speed information is displayed, which corresponds to the device specific speed settings from the firmware. "fix" indicates, that the speed has been set manually.

Example:

TAP A **Port 0** **DOWN**: Link down not fixed to speed,
 Port 1 **DOWN fix 10 Mbit/s**: Link down fixed to 10 Mbit/s,
TAP B **Port 2** **UP 10 Mbit/s**: link up with 10 Mbit/s,
 Port 3 **UP 100 Mbit/s**: link up with 100 Mbit/s

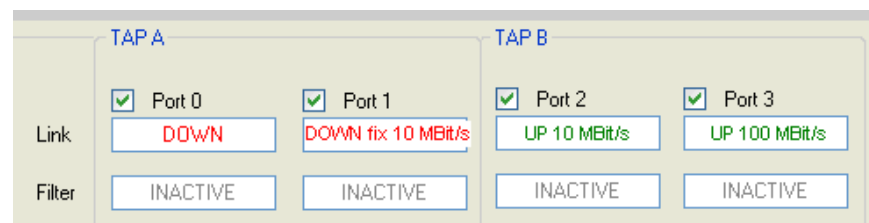


Figure 58: Example - Link Speed Information



Note: On the analyzer card NANL-C500-RE Rev. 4 and earlier the speed for Port 2 and Port 3 can not be determined.

8.4 Performing File Settings

- Select **Settings >File Settings**.

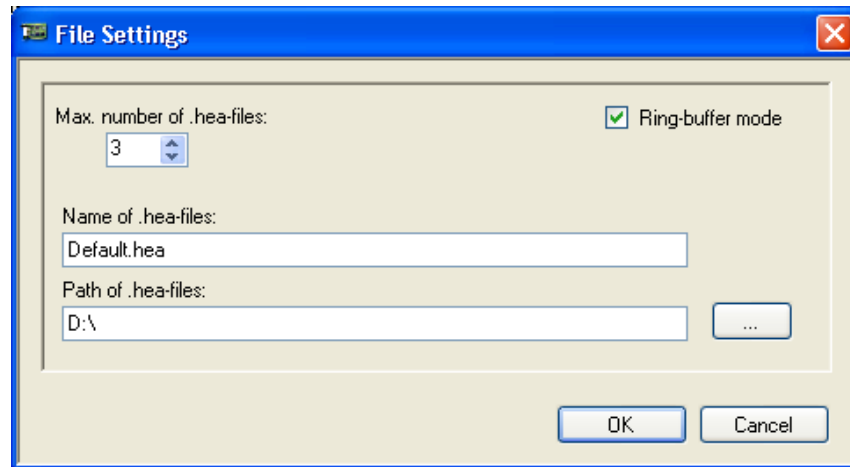


Figure 59: File Settings

Control	Explanation	Range of Value / Value
Max. number of .hea files	Maximum number *.hea files, which is to be saved before the capturing is stopped. The maximum file size for per *.hea file is 1GB. ➔ Note: Check the storage capacity of your hard disk before increasing the Max. number of .hea-files to prevent the creating file error. For more refer to section <i>Important Error Codes, Causes and Troubleshooting</i> on page 137. Note when using the Ring Buffer: If the ring buffer shall be used and the number of *. hea files shall be n, due to the overflow properties of the ring buffer, the value set under Max. number of .hea-files must be defined by n +1 each.	1 ... 100
Ring-buffer mode	If checked, the capturing data are stored to the ring buffer. If unchecked the capturing data are stored to a stack buffer (stack buffer mode) and the data capturing is be finished automatically if all .hea files are filled completely. Refer also to error code 0xC07700000 description (end of capture file reached) in section <i>Important Error Codes, Causes and Troubleshooting</i> on page 137. ➔ Note: The use of the ring buffer is only useful for values for Max. number of .hea-files ≥ 2. Overflow of the Ring Buffer: In the ring buffer, the *. hea files according to the preset number Max. number of .hea-files are filled sequentially. If the last file is filled, the file filled first will be overwritten next. Example: If under Max. number of .hea-files a value of 3 has been set, only two *. hea files are effectively backed up.	checked / unchecked, Default: checked
Name of .hea files	Name for *.hea files. ➔ Note: The total number of characters of the file storage path AND the file name is at its maximum 112 characters long, inclusively the number of characters of the file name extension „_n“ or „_nn“. Example: The length of the file name is 112 characters minus 52 characters for the path minus 2 characters for the file ending „_n“ = 58 characters or 57 characters if the file ending „_nn“ requires 3 characters.	1 ... (112 – number characters path – number ending „_n“ or „_nn“)

Control	Explanation	Range of Value / Value
Path of .hea files	Path to be defined by the operator, under which the netANALYZER / netSCOPE Device Driver shall save the binary file (*.hea). Upon netANALYZER software the default path is prepared as "My Documents\netANALYZER\hea". This is the default path for .hea files. After the first usage of the netANALYZER software, the last used path is the default path.  Important! The binary files (*.hea) may only be stored on NTFS partitions and not on FAT32 partitions.	1 ... (112 - number characters file name)

Table 23: Description File Settings

- Determine in the window **File Settings** under **Max Number of .hea files** the number of binary files to be stored.
- Check **Ring-buffer mode** to define, that the capturing data are to be stored to the ring buffer.
- Under **Name of .hea files** define the systematic name of the *.hea files.
- Under the **Path of .hea files** determine where the binary files will be stored.
- Click to the **OK** button to close the window **File Settings**.

8.5 GPIO Settings

➤ Select **Settings >GPIO Settings**.

Example GPIO Configuration

GPIO Settings

GPIO Configuration

GPIO	Configuration	Frequency (Hz)
GPIO 0:	off	0
GPIO 1:	output high	0
GPIO 2:	output square-wave generator	10000
GPIO 3:	off	0

Voltage: 3.3V

Trigger Configuration

Start on: manual

Stop on: manual

Delay: 5 μs

OK Cancel

Selection Options GPIO Configuration

GPIO Configuration

GPIO	Configuration
GPIO 0:	off
GPIO 1:	output high
GPIO 2:	output square-wave generator
GPIO 3:	off, input rising edge, input falling edge, output low, output high, output square-wave generator

Voltage: 3.3V

Trigger Configuration

Start on: manual

Stop on: manual

Delay: 5 μs



Note! The GPIO event **output square-wave generator** (with the **Frequency** field) is only available once at a time. If **output square-wave generator** is selected for one GPIO this event cannot be selected for any other GPIO at the same time (the hardware has internally only one signal generator).

Example Trigger Configuration

GPIO Settings

GPIO Configuration

GPIO	Configuration	Frequency (Hz)
GPIO 0:	input rising edge	0
GPIO 1:	input rising edge	0
GPIO 2:	input falling edge	0
GPIO 3:	input falling edge	0

Voltage: 3.3V

Trigger Configuration

Start on: GPIO 0

Stop on: GPIO 3

Delay: 5 μs

OK Cancel

Selection Options Trigger Configuration

Trigger Configuration

Start on: manual

Stop on: manual

Delay: 5 μs



Note! A Trigger on a GPIO event is only possible for GPIOs which are in **input rising edge** or **input falling edge** mode.

Figure 60: GPIO Settings



Note: If for the start or the end of the capturing process a GPIO event is selected, that will not be checked (e. g. "OFF"), the data capturing process will not start.

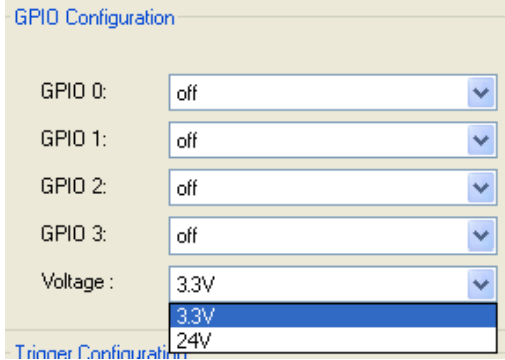
Control	Explanation	Range of Value / Value
GPIO Configuration / GPIO 0, GPIO 1, GPIO 2, GPIO 3	Selection list, which GPIO event shall be assigned to which GPIO (external input/output) and is displayed as a pseudo frame in Wireshark.	off, input rising edge, input falling edge, output low, output high, output square-wave generator
	GPIO Event	
	off	
	input rising edge	
	input falling edge	
	output low	
	output high	
	output square-wave generator	
Voltage	3.3V: 3.3V are supported at the GPIOs. 24V: 24V are supported at the GPIOs.  If the Voltage setting is changed, the IO State LED indicates the different GPIO states: 24V out-put (red), 3.3V output (yellow), 3.3V input (green) and 24V input (off). See also section LEDs NANL-B500G-RE on page 141.	3,3V; 24V, Default: NANL-C500-RE, NANL-B500E-RE: 3,3 V; NANL-B500G-RE: 3,3V; 24V
Frequency	The Frequency field of the appropriate GPIO is only enabled if output square-wave generator was selected. Then the frequency of the output signal of the selected GPIO can be entered here.	1 Hz ... 100 000 Hz
Trigger Configuration / Start on, Stop on	Selection list for the start and the end of the capturing of the GPIO. Manual: The capturing process is started and stopped manually, via the netANALYZER user interface. Note: A Trigger on a GPIO event is only possible for GPIOs (external inputs) which are in input rising edge or input falling edge mode.	manual, GPIO 0, GPIO 1, GPIO 2, GPIO 3
Delay	Time after the stop event during which still data are captured.	0 ... 40.000.000 µs; Default 0µs

Table 24: Descriptions to the GPIO Settings

- Define under **GPIO Configuration** which GPIO event shall be assigned to which GPIO.
- Define under **Trigger Configuration** the GPIO event for the start and the end of the data capturing and the delay time.
- For NANL-B500G-RE select under **Voltage 3.3V** or **24 V**.

8.6 Filter Settings for the Hardware Filters

The hardware filters¹ works as upstream filters pre-located to the software filters. To reduce the amount of data or to select analysis data more specific, one or two filter masks can be defined. Already defined filters can be saved and reloaded.

The filter mask checks the first 512 Bytes of the frame, consisting of the destination MAC address (Byte 0 to 5), the source MAC address (6 to 11 Bytes), the Ether-type (Byte 12 and 13) in the first two Bytes for the frame data.



Note: All predefined filters are provided with a write protection. I. e., the filter masks defined under **Enable Filter A** or **Enable Filter B** can not be changed and the values for „Mask“ and „Value“ in the filter mask can not be edited.

Opening Filter Settings:



Note: In order to access to the **Filter Settings** menu, the netANALYZER hardware installation in your PC is required. If you start the netANALYZER software via **Proceed without device**, you can not open the **Filter Settings** menu.

➤ Select **Settings > Filter Settings**.

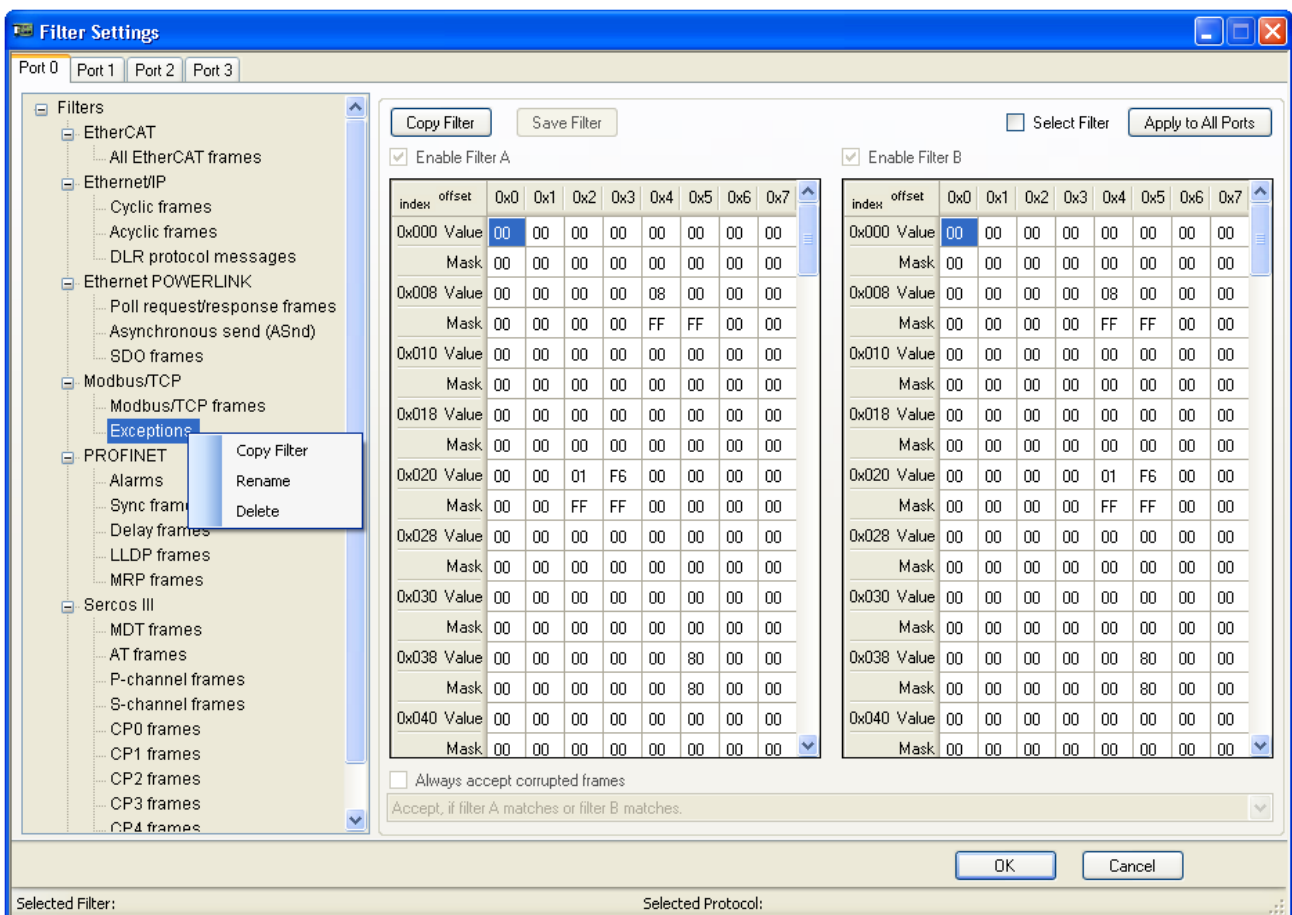


Figure 61: Filter Settings

¹ This corresponds to the 'Capture Filter' in Wireshark. Refer also to section *Filter Principles* on page 96.

Control	Explanation	Range of Value / Value
Port	Filter settings page per Port	Port 0, Port 1, Port 2, Port 3
Filters	Selection list as tree structure with predefined filters for different Ethernet protocols. To add a newly defined filter the tree structure can be enlarged. E. g. via right click on Modbus/TCP > Exceptions the menu Copy Filter, Rename, Delete is opened to copy, rename or delete a filter.	Predefined filters an newly defined filters
Copy Filter	Copies the filter selected under the Filters and adds this one as copy below.	
Save Filter	Saves the newly defined filter.	
Select Filter for this Port	Defines the under Filters selected filter for this port.	
Apply to All Ports	The selected filter is applied to all ports.	
Enable Filter A Enable Filter B	Definable filter masks: „Filter A“ or „Filter B“ or „Filter A and Filter B“. All predefined filters are provided with a write protection.	checked: Filter A, Filter B, Filter A and Filter B
Filter Matrix	Matrix for entering byte- and mask values.	1-512 byte
Offset	Byte Offset for each 8 Byte of a frame, which are indexed by the Byte Index.	0x0 to 0x7
Index	Byte Index, which defines 64 x each 8 Byte of a frame.	0x000 to 0x1F8
Value	Assessed value under restriction of the mask. Entry in hexadecimal notation	0 ... FF hex
Mask	Mask Value = 0: Value of the value-Bit is not included. Value = 1: Value of the value-Bit is included. Entry in hexadecimal notation	0 ... FF hex
Always accept corrupted Frames	Faulty Frames should always be displayed, even if they would be filtered out otherwise.	
Selection List Filter Configuration	Selection list of the possible combinations of the following filter options: 1. Accept / reject value 2. Filter A and / or filter B 3. Value must be true or should not apply 4. And or link of the values (In the case of multiple filters) Depending on what filter/s are selected, the list box offers different options.	
Selected Filter:	Under Filters selected filter	
Selected Protocol:	Under Filters selected protocol	

Table 25: Filter Settings – Window Filter Settings

8.6.1 Selection List Filter Configuration

The selection list filter configuration offers the following options:

Filter A	Filter B	Configuration:
X	X	Accept, if filter A matches and filter B matches.
X	X	Accept, if filter A doesn't match and filter B matches.
X	X	Accept, if filter A matches and filter B doesn't match.
X	X	Accept, if filter A doesn't match and filter B doesn't match.
X	X	Accept, if filter A matches or filter B matches.
X	X	Accept, if filter A doesn't match or filter B matches.
X	X	Accept, if filter A matches or filter B doesn't match.
X	X	Accept, if filter A doesn't match or filter B doesn't match.
X	X	Reject, if filter A matches and filter B matches.
X	X	Reject, if filter A doesn't match and filter B matches.
X	X	Reject, if filter A matches and filter B doesn't match.
X	X	Reject, if filter A doesn't match and filter B doesn't match.
X	X	Reject, if filter A matches or filter B matches.
X	X	Reject, if filter A doesn't match or filter B matches.
X	X	Reject, if filter A matches or filter B doesn't match.
X	X	Reject, if filter A doesn't match or filter B doesn't match.
X		Accept, if filter A matches.
X		Accept, if filter A doesn't match.
X		Reject, if filter A matches.
X		Reject, if filter A doesn't match.
	X	Accept, if filter B matches.
	X	Accept, if filter B doesn't match.
	X	Reject, if filter B matches.
	X	Reject, if filter B doesn't match.

Table 26: Combinations of the Selection List Filter Configuration

8.6.2 Defining, saving, loading Filter Settings

To define, to save or to load filter settings for one or several filters, proceed as follows:

1. Enable checkbox Enable Filter A or Enable Filter B or Enable Filter A and Enable Filter B.
2. Enter the value to be assessed under restriction of the mask in the line **Value**.

Entry in hexadecimal notation, value ranges from 00 to FF.

3. Enter the desired mask in the line **Mask**.

Value = 0: Value of the value-Bit is not included.

Value = 1: Value of the value-Bit is included.

Value in Mask	Value used for the Filter
FF	The value FF effects, that the value in ,Value' is used for the Filter.
00	The value 00 effects, that the value in ,Value' is not used for the Filter.
0F	The value 0F effects that lower 4 Bits of the value in ,Value' are used for the Filter.
F0	The value F0 effects, that upper 4 Bits of the value in ,Value' are used for the Filter.

Table 27: Value used for the Filter

Entry in hexadecimal notation, value range from 00 to FF.

Example:

	Destination MAC Address						Source MAC Address						Data Type		User Data	
Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	00	15	CF	DD	DA	BE	00	00	00	00	00	00	00	00	00	00
Mask	FF	FF	FF	00	00	00	00	00	00	00	00	00	00	00	00	00

Table 28: Example Defining Filter Settings

The filter shown in the example filters for frames beginning with 00,15, CF.

4. Enable **Always check accept corrupted frames**.
 Faulty Frames are always displayed, even if they would be filtered out otherwise.
5. Select in the selection list filter configuration a combination of the filter options.

Depending on what filter/s are selected, the list box offers different options.

6. Save the current filter via **Save Filter**.

8.7 PHY Settings

Via **PHY Settings** for Port 0 to Port 3 the data transmission rate can be set manually to a defined value. Then every Ethernet telegram is captured from the beginning on. With the setting **Auto** no data capturing is provided during auto negotiation.



Note: For a good portion of all applications the **Auto** setting for **PHY Configuration** is comfortable. A typical application when the transmission rate must be defined manually to 100 Mbit/s, is given e. g. with the PROFINET / Fast-Startup.

Proceeding, how to set the transmission rate:

- Select **Settings > PHY Settings**.

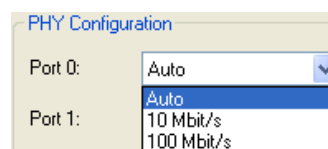
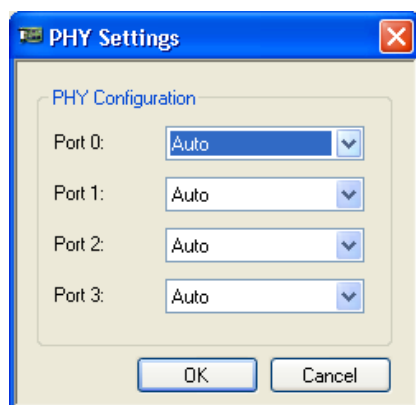


Figure 62: PHY Settings

Control	Explanation	Range of Value / Value
PHY Configuration / Port 0 to Port 3	For Port 0 to Port 3 the transmission rate can be set manually per port.	Auto, 10 Mbit/s, 100 Mbit/s, Default: Auto

Table 29: GPIO Settings

- Under **PHY Configuration > Port 0 to Port 3** each set the transmission rate.

8.8 Extended Software Filter Settings

By use of the **Extended Software Filters** including an identification function, telegrams are prefiltered for the software analysis. The extended software filters are extremely flexible in terms of filter capabilities. For the netload analysis, described in section *Netload Analysis* beginning on page 128, the extended software filters are required to measure the netload of various protocols transmitted via Ethernet. The extended software filters can be combined with the hardware filters described in section *Filter Settings for the Hardware Filters* beginning on page 91. The extended software filters are user configurable and can be stored on the hard disk of the PC. For the netload analysis various pre-defined filters can be loaded.

8.8.1 Filter Principles

The extended software filters work as downstream filters subsequent to the hardware filters and can be enabled or disabled. When filtering the software goes on the filter tree along and makes the decisions given there as filter entries. Thereby the telegrams are examined towards the criteria of the filter entries and the sought telegrams are identified. Possible types of filter entries are:

- Byte Match"
- Port Match"
- Frame Length"
- Value Match"

For filter trees with multiple sub-trees the filter is running in parallel over the sub-trees. By this, depending on the chosen connections, such as "or" or "and", telegrams can be assigned simultaneously to multiple categories.

8.8.2 Creating Filter Entries and Identification

1. Creating Filter Entries

- Open the **Extended Software Filters** window via the netANALYZER main window >**Settings** > **Extended Software Filter Settings**.

Via the associated **Add Filter Entry** dialogs filters can be defined, which will filter by specific byte values (Byte Match), netANALYZER ports or GPIOs (Port Match), a particular frame length (Frame Length) and certain values (Value Match).

2. Adding Identification Entry

- Access to the window via **Add Identification Entry**.
- Enter in the filed **Identify this Frame a** an identification description for the frame.



For further information refer to the sections :

- *Extended Software Filters*, page 97,
- *Add Filter Entry*, page 100,
- *Add Identification Entry*, page 105.

8.8.3 Extended Software Filters

In the **Extended Software Filters** window, the filter entries can be created in the form of a filter tree. About **Add Filter Entry** and **Add Identification Entry** entries can be added or removed via **Remove Entry**.

- Open the **Extended Software Filters** window via the netANALYZER main window > **Settings** > **Extended Software Filter Settings**.

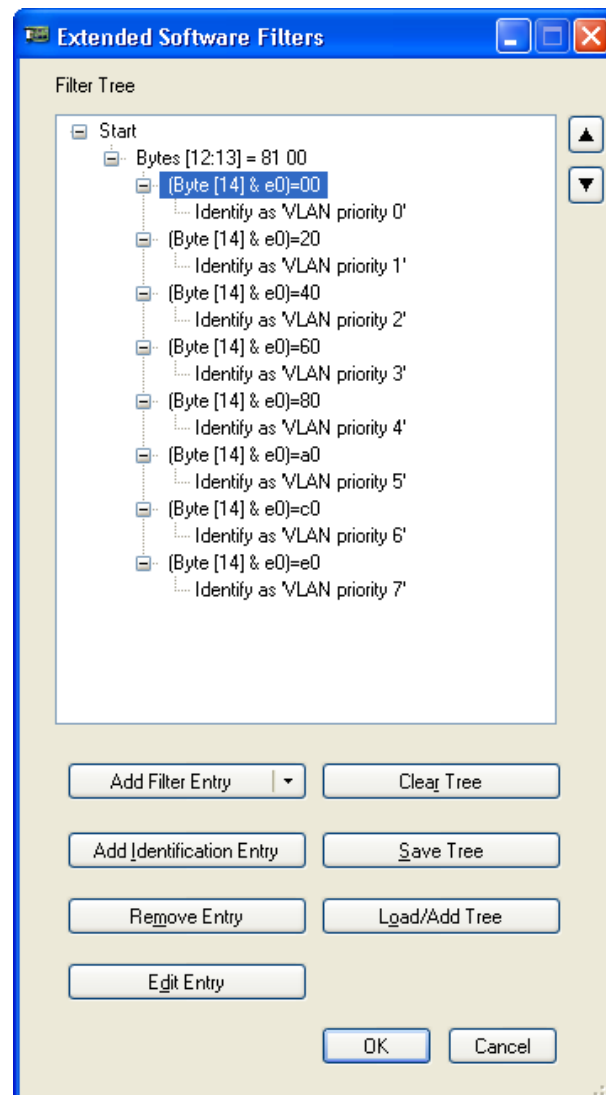


Figure 63: Example Extended Software Filters

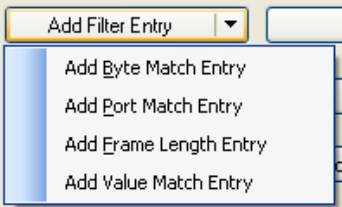
Element	Descriptions
Filter Tree	The Filter Tree window contains the filter entries for decision making in the form of a filter tree. Each entry contains the filter condition ("Decision Entry") and an identification entry ("End of the Decision").  Note: Via double click on a filter entry or via Edit Entry the Edit Filter window opens and the filter entry settings can be edited.
	Arrow buttons to move a filter entry to a new position within the filter tree. For more refer to section <i>Moving Filter Entry</i> on page 99.
Add Filter Entry	Via Add Filter Entry the filter options can be selected: - Add Byte Match Entry - Add Port Match Entry - Add Frame Length Entry - Add Value Match Entry For more refer to section <i>Add Filter Entry</i> on page 100. 
Add Identification Entry	Via Add Identification Entry a dialog is opened with the field Identify this Frame as where an identification description must be entered. For more refer to section <i>Add Identification Entry</i> on page 105.
Remove Entry	Via Remove Entry entries can be removed.
Edit Entry	Via Edit Entry entries can be edited.
Clear Tree	Via Clear Tree the complete filter tree is deleted, only the Start entry remains.
Save Tree	With Save Tree the complete filter tree can be stored as XML file on the hard disk. Upon netANALYZER software the default path is prepared as: "My Documents\netANALYZER\Software Filter". This is the default path for the XML software filter files. After the first usage of the netANALYZER software, the last used path is the default path.
Load/Add Tree	With Load/Add Tree a previously saved file can be selected, which will be added in the filter tree at the current cursor position. Thus, different subfilter trees with specific filter functions are stored on the hard disk that can be merged together to form a complex complete filter. Upon netANALYZER installation software filter examples are installed to: "My Documents\netANALYZER\Software Filter". This is the default path for the XML software filter files. After the first usage of the netANALYZER software, the last used path is the default path.
Ok	OK accepts the changes and the Extended Software Filters window closes.
Cancel	About Cancel the changes are discarded and the Extended Software Filters window closes.

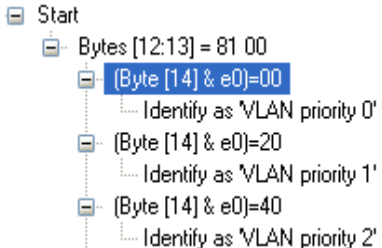
Table 30: Explanations Window Extended Software Filters

8.8.4 Moving Filter Entry

In the **Extended Software Filters** window, a filter entry can be moved by use of the arrow buttons  or  to a new position within the filter tree.

Example

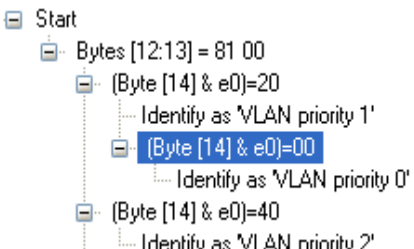
Moving a filter entry *downwards*:

1. Click on the filter entry.
 

```

graph TD
    Start[Start] --> B1213[Bytes [12:13] = 81 00]
    B1213 --> B14e0_20["(Byte [14] & e0)=20"]
    B14e0_20 --> B14e0_00["(Byte [14] & e0)=00"]
    B14e0_20 --> B14e0_20_desc["Identify as 'VLAN priority 0'"]
    B14e0_20 --> B14e0_20_2["(Byte [14] & e0)=20"]
    B14e0_20_2 --> B14e0_20_2_desc["Identify as 'VLAN priority 1'"]
    B14e0_20_2 --> B14e0_20_2_2["(Byte [14] & e0)=40"]
    B14e0_20_2_2 --> B14e0_20_2_2_desc["Identify as 'VLAN priority 2'"]
      
```
2. Click on .

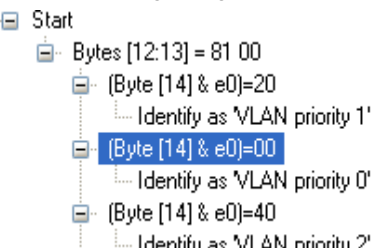
⇒ The filter entry is moved to a position below the next filter entry. Its position within the tree hierarchy is one level subordinated to that before (further to the right).



```

graph TD
    Start[Start] --> B1213[Bytes [12:13] = 81 00]
    B1213 --> B14e0_20["(Byte [14] & e0)=20"]
    B14e0_20 --> B14e0_20_desc["Identify as 'VLAN priority 1'"]
    B14e0_20 --> B14e0_40["(Byte [14] & e0)=40"]
    B14e0_40 --> B14e0_40_desc["Identify as 'VLAN priority 2'"]
    B14e0_40 --> B14e0_00["(Byte [14] & e0)=00"]
    B14e0_00 --> B14e0_00_desc["Identify as 'VLAN priority 0'"]
      
```
3. Click on the filter entry once more.
4. Click on  once more.

⇒ The filter entry is moved to a position below the Identify entry and is at the same level as in the beginning.



```

graph TD
    Start[Start] --> B1213[Bytes [12:13] = 81 00]
    B1213 --> B14e0_20["(Byte [14] & e0)=20"]
    B14e0_20 --> B14e0_20_desc["Identify as 'VLAN priority 1'"]
    B14e0_20 --> B14e0_00["(Byte [14] & e0)=00"]
    B14e0_00 --> B14e0_00_desc["Identify as 'VLAN priority 0'"]
    B14e0_20 --> B14e0_40["(Byte [14] & e0)=40"]
    B14e0_40 --> B14e0_40_desc["Identify as 'VLAN priority 2'"]
      
```

Table 31: Example Moving a Filter Entry downwards

8.8.5 Add Filter Entry

8.8.5.1 „Byte Match“

In the window **Edit Filter „Byte Match“** filters can be defined which will filter by specific byte values.

- To access to the window select **Add Filter Entry > Add Byte Match Entry**.

Figure 64: Example Edit Filter „Byte Match“

Element	Descriptions
Start byte position n in decimal to match (use 'x:y' for range)	➤ Enter the byte position n in decimal notation. Note: The counting starts at zero! Example: '14' = Byte position 14.
Mask[] in Hexadecimal (use one value 'xx' for all bytes or a sequence of values 'xx yy zz' if each byte shall have its own mask, leave blank if no mask shall be used)	➤ Enter the mask in hexadecimal notation. Example: The Byte in the Byte position 14 gets masked with the value 'e0'.
Value[] in Hexadecimal (use one value 'xx' for all bytes or a sequence of values 'xx yy zz' if each byte shall have its own value)	➤ Enter the value in hexadecimal notation. Example: value = 00
Condition (=, <, >, <=, >=, !=)	➤ Select a mathematical operand as condition. Example: Condition '=', i. e., the Byte at the chosen position must match with the value indicated.

Table 32: Explanations Edit Filter „Byte Match“

8.8.5.2 Example how to count the Byte Position

The Byte position for ‚a2’ of the 00:02:a2:21:2b:5b destination MAC address shall be indicated in decimal.

If the captured .pcap file is converted to the extended pcap file format (compare section *Converting Binary Files into WinPcap Format* on page 109), in wireshark (from version 1.7.1) the „netANALYZER frame Info Block“ appears in the first 4 Bytes before the Ethernet-Frame.

```

Frame 33: 106 bytes on wire (848 bits), 106 bytes captured (848 bits)
netANALYZER (Port: 0, Length: 102 bytes, Status: No Error)
Ethernet II, Src: Hilscher_20:2d:20 (00:02:a2:20:2d:20), Dst: Hilscher_21:2b:5b (00:02:a2:21:2b:5b)
  Destination: Hilscher_21:2b:5b (00:02:a2:21:2b:5b)
    Address: Hilscher_21:2b:5b (00:02:a2:21:2b:5b)
      ....0. .... = LG bit: Globally unique address (factory default)
      ....0. .... = IG bit: Individual address (unicast)
  Source: Hilscher_20:2d:20 (00:02:a2:20:2d:20)
    Address: Hilscher_20:2d:20 (00:02:a2:20:2d:20)
      ....0. .... = LG bit: Globally unique address (factory default)
0000  00 04 66 00 00 02 a2 21 2b 5b 00 02 a2 20 2d 20  ..f...!+...-
0010  08 00 45 bc 00 54 2b 54 00 00 01 11 f8 35 c0 a8  ..E..T+T...5...
0020  0a 01 c0 a8 0a 02 08 ae 08 ae 00 40 13 e4 02 00  ...@...m.....
0030  02 80 08 00 02 00 f1 60 6c f8 00 00 b1 00 26 00  ....n...&.....
0040  00 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0050  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0060  00 00 00 00 00 00 f7 0c 87 50                    .....P

```

Figure 65: Wireshark 1.7.1: Example „netANALYZER frame Info-Block“ displayed



Note: The counting starts at zero! In wireshark you must take into consideration the 4 bytes of the „netANALYZER frame Info-Block“.

The read offset for the byte position ‚a2’ is ([0] [1] [2] [3] [4] [5] [6]) offset = 6.

- Offset 0 = 00 (netANALYZER frame Info Block)
- Offset 1 = 04 (netANALYZER frame Info Block)
- Offset 2 = 66 (netANALYZER frame Info Block)
- Offset 3 = 00 (netANALYZER frame Info Block)
- Offset 4 = 00 (destination MAC address)
- Offset 5 = 02 (destination MAC address)
- Offset 6 = a2 (destination MAC address)

From the offset 6 you have to subtract the value 4. For the byte position ‚a2’ under **Byte position(s) in decimal to match** enter „2“.

Or: If you do not check **Convert to extended .pcap file including additional frame information** for the conversion, the „netANALYZER frame Info-Block“ won’t be added. Then you directly can read the offset for the byte position ‚a2’, with ([0] [1] [2]) offset = 2.

```

Frame 33: 102 bytes on wire (816 bits), 102 bytes captured (816 bits)
Ethernet II, Src: Hilscher_20:2d:20 (00:02:a2:20:2d:20), Dst: Hilscher_21:2b:5b (00:02:a2:21:2b:5b)
  Destination: Hilscher_21:2b:5b (00:02:a2:21:2b:5b)
    Source: Hilscher_20:2d:20 (00:02:a2:20:2d:20)
      Type: IP (0x0800)
      Frame check sequence: 0xe705721d [correct]
  Internet Protocol Version 4, Src: 192.168.10.1 (192.168.10.1), Dst: 192.168.10.2 (192.168.10.2)
  User Datagram Protocol, Src Port: EtherNet-IP-1 (2222), Dst Port: EtherNet-IP-1 (2222)
  EtherNet/IP (Industrial Protocol)
0000  00 02 a2 21 2b 5b 00 02 a2 20 2d 20 08 00 45 bc  .....!+...-..E.
0010  00 54 2b 54 00 00 01 11 f8 35 c0 a8 0a 01 c0 a8  ..T+T...5.....
0020  0a 02 08 ae 08 ae 00 40 f1 6d 02 00 02 80 08 00  ...@...m.....
0030  04 00 f1 60 8d 6e 00 00 b1 00 26 00 00 00 01 00  ....n...&.....
0040  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0050  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0060  00 00 e7 05 72 1d                    .....r.

```

Figure 66: Wireshark 1.7.1: Example „netANALYZER frame Info-Block“ not displayed

- Offset 0 = 00 (destination MAC address)
- Offset 1 = 02 (destination MAC address)
- Offset 2 = a2 (destination MAC address)

8.8.5.3 „Port Match“

In the window **Edit Filter „Port Match“** filters can be defined which will filter by specific netANALYZER ports or GPIOs.

- To access to the window select **Add Filter Entry > Add Port Match Entry**.

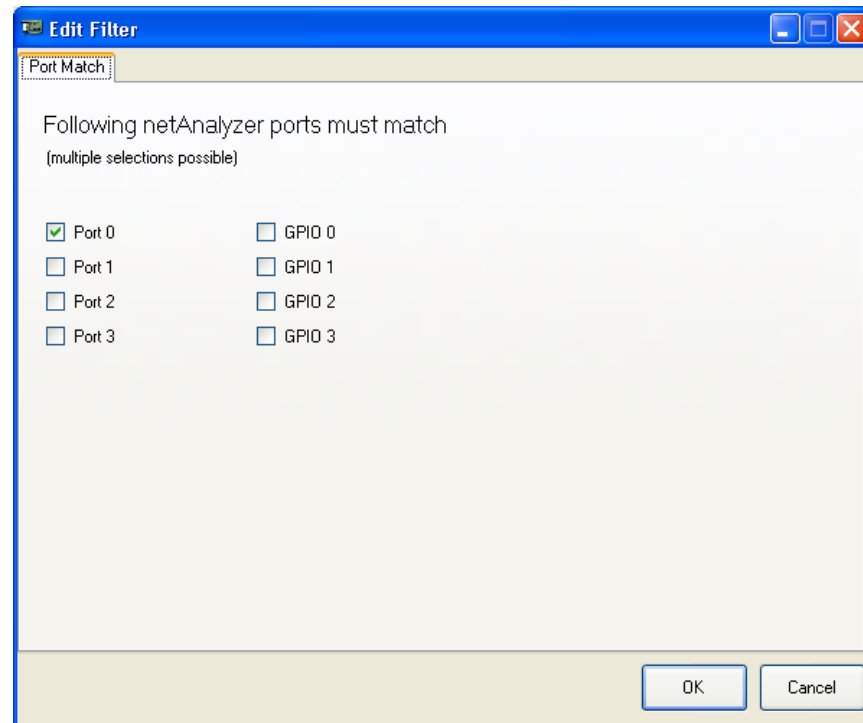


Figure 67: Example Edit Filter „Port Match“

Element	Descriptions
Following netANALYZER ports must match (multiple selections possible)	➤ Check ports or GPIOs which must match.

Table 33: Explanations Edit Filter „Port Match“

8.8.5.4 „Frame Length“

In the window **Edit Filter „Frame Length“** filters can be defined which will filter by a specific frame length.

- To access to the window select **Add Filter Entry > Add Frame Length Entry**.

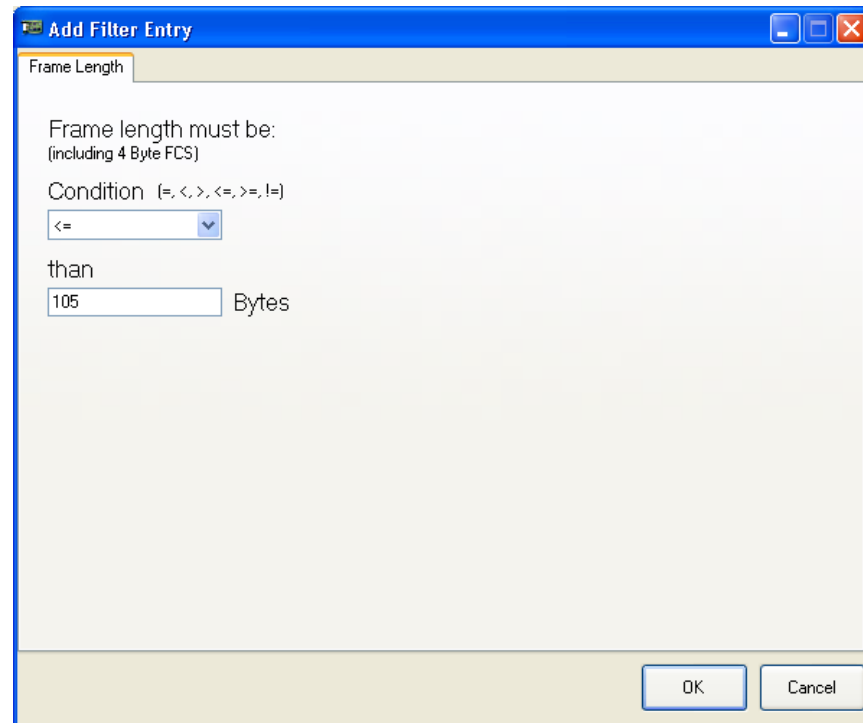


Figure 68: Example Edit Filter „Frame Length“

Element	Descriptions
Frame length must be (including 4 Byte FCS)	FCS = Frame Check Sequence (Ethernet check sum) (Check sum at the frame end for error detection) Note: The frame length corresponds to the byte count of the Ethernet frame. The four bytes of the „netANALYZER frame Info Block“ are not included.
Condition (=, <, >, <=, >=, !=)	➤ Select a mathematical operand as condition.
than Bytes	➤ Enter a value for the frame length into the Bytes field. For the value 105 specified in <i>Figure 68</i> , the condition '<=' matches on frames if the frames are shorter or equal to 105 bytes.

Table 34: Explanations Edit Filter „Frame Length“

8.8.5.5 „Value Match“

In the window **Edit Filter „Value Match“** filters can be defined which will filter by specific values.

- To access to the window select **Add Filter Entry > Add Value Match Entry**.

The screenshot shows the 'Add Filter Entry' dialog box with the 'Value Match' tab selected. The fields are as follows:

- Value's data type:** A dropdown menu showing 'INT32'.
- Endianness:** Two radio buttons: 'Little Endian (4:1)' (selected) and 'Big Endian (1:4)'.
- Value's offset in Ethernet frame:** A text box containing '14'.
- Condition:** A dropdown menu showing '>='.
- Value:** Two text boxes: 'hex: 0x00008000' and 'dec: 32768'.

At the bottom right are 'OK' and 'Cancel' buttons.

Figure 69: Example Edit Filter „Value Match“

Element	Descriptions
Value's data type:	Under Value's Data Type the following data types can be selected: INT8, UINT8, INT16, INT16, INT32, UINT32, INT64, UINT64 Value's data type: INT8 INT8 UINT8 INT16 UINT16 INT32 UINT32 INT64 UINT64 ➤ Select value's data type.
Endianness: Little Endian (4:1), Big Endian (1: 4)	The byte sequence option Endianness is necessary for any data type except of CHAR.
Value's offset in Ethernet frame: (Ethernet frame size between 64-1522)	➤ Enter offset for the value in the Ethernet frame.
Condition (=, <, >, <=, >=, !=)	➤ Select a mathematical operand as condition.
Value	➤ Enter a value to match.

Table 35: Explanations Edit Filter „Value Match“

8.8.6 Add Identification Entry

The dialog **Add Identification Entry** allows to enter an identification description. This description is used in the netload analysis, when an appropriate frame was identified.

➤ Access to the window via **Add Identification Entry**.

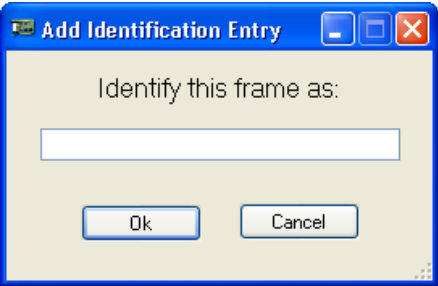


Figure 70: Dialog Add Identification Entry

Element	Description
Identify this Frame as	➤ Enter in the filed Identify this Frame a an identification description for the frame.

Table 36: Explanations Dialog Add Identification Entry

8.9 Analysis Configuration

In the window **Analysis Configuration** can be determined:

- whether or not the extended software filters are to be used (the Netload Analysis always used the extended software filters), and
 - whether at the timing analysis a histogram, a history or a combination of both should be displayed as a graph.
 - Further, an upper limit can be determined on the amount of data, which can be captured.
- Open the window via **Settings > Analysis Configuration**.

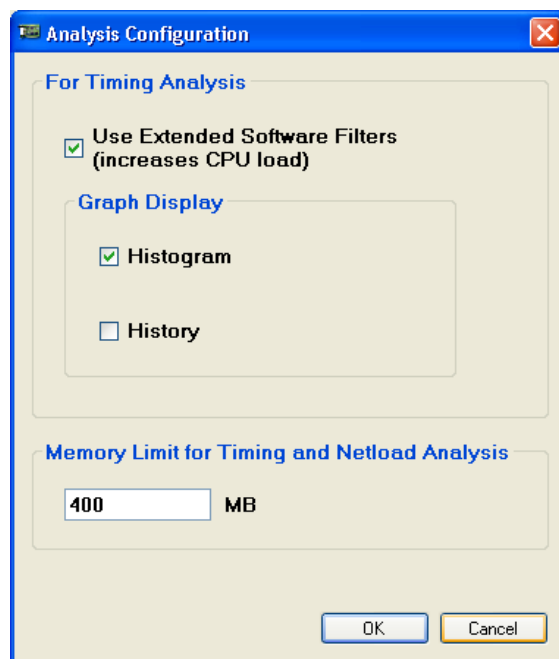


Figure 71: Analysis Configuration

Element	Description
Use Extended Software Filters (increases CPU load)	If Use Extended Software Filters is checked, the extended software filters are also used in the Timing Analysis. The Netload Analysis always uses the extended software filters!
Graph Display Histogram History	For the timing analysis at least one graph type must be selected. Otherwise the error message Select at least one graph type appears. ➤ Check Histogram or check History alternatively or additionally.
Memory Limit for Timing and Netload Analysis	The netANALYZER analysis data are stored in the RAM of the PC. Memory Limit for Timing and Netload Analysis sets an upper limit for the maximum exportable data, such as 1 GB. If the specified maximum storage space is completely used, the message will be displayed: <i>NOTICE, memory is full. Old values are discarded.</i>

Table 37: Analysis Configuration Options



Important! If the amount of data recorded exceeds the fixed upper memory limit, only the data from recording span according to the memory limit can be backed up. Old values will be discarded.

8.10 About Hilscher netANALYZER

In the **About Hilscher netANALYZER** window you will find information about the copyright for netANALYZER and to the versions of the netANALYZER software, the netANALYZER firmware, the netANALYZER / netSCOPE Device Driver and the netANALYZER Toolkit.

- Access to the **About Hilscher netANALYZER** window via **Settings > Info**.



Figure 72: About Hilscher netANALYZER

Element	Description
Version Windows-Application	Version of the netANALYZER Software
Version Firmware	Version of the netANALYZER Firmware
Version Driver	Version of the netANALYZER / netSCOPE Device Driver
Version Driver Toolkit	Version of the netANALYZER Toolkit
Version Marshaller Client	Version of the Marshaller Client
Version Marshaller Server	Version of the Marshaller Server
Version GbE device driver	Version of the device driver of the netANALYZER portable Device RTE Gigabit
Version GbE device driver toolkit	Version of the device driver toolkit of the netANALYZER portable Device RTE Gigabit

Table 38: Description on About Hilscher netANALYZER

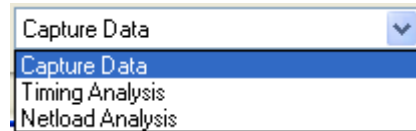
9 netANALYZER Analysis Methods

9.1 Data Capturing

9.1.1 Starting Capturing

1. Select Capture Data Mode

➤ In the **netANALYZER** window select **Capture Data**.



2. Activating or deactivating Ring Buffer.

➤ In the **netANALYZER** window select **Settings > File Settings** and in the **File Settings** window check **Ring-buffer mode**.

⇒ The capturing data are stored to the ring buffer.

Or

➤ Do not check **Ring-buffer mode**.

⇒ The capturing data are stored to a stack buffer (stack buffer mode) and data capturing is finished automatically, when all .hea files are filled completely.

3. Activating the Ports for the Data Capturing.

➤ In the **netANALYZER** window check the capturing ports required.

4. Starting Data Capturing

➤ In the **netANALYZER** window click on **Start**.

⇒ The capturing process of the received Ethernet frames starts.

During the capturing process all elements in the window **netANALYZER** are disabled.

5. Stopping Data Capturing

➤ In the **netANALYZER** window click on **Stop**.

9.1.2 Converting Binary Files into WinPcap Format

- Click in the window **netANALYZER** to **Convert**.
- In the window **Path of .hea file and .pcap files** are displayed:
 - Under **.hea File > All filtered .hea files for this name or capture**: the filtered *.hea files.
 - Under **.pcap files > .pcap files that will be generated**: the *.pcap files to be converted.

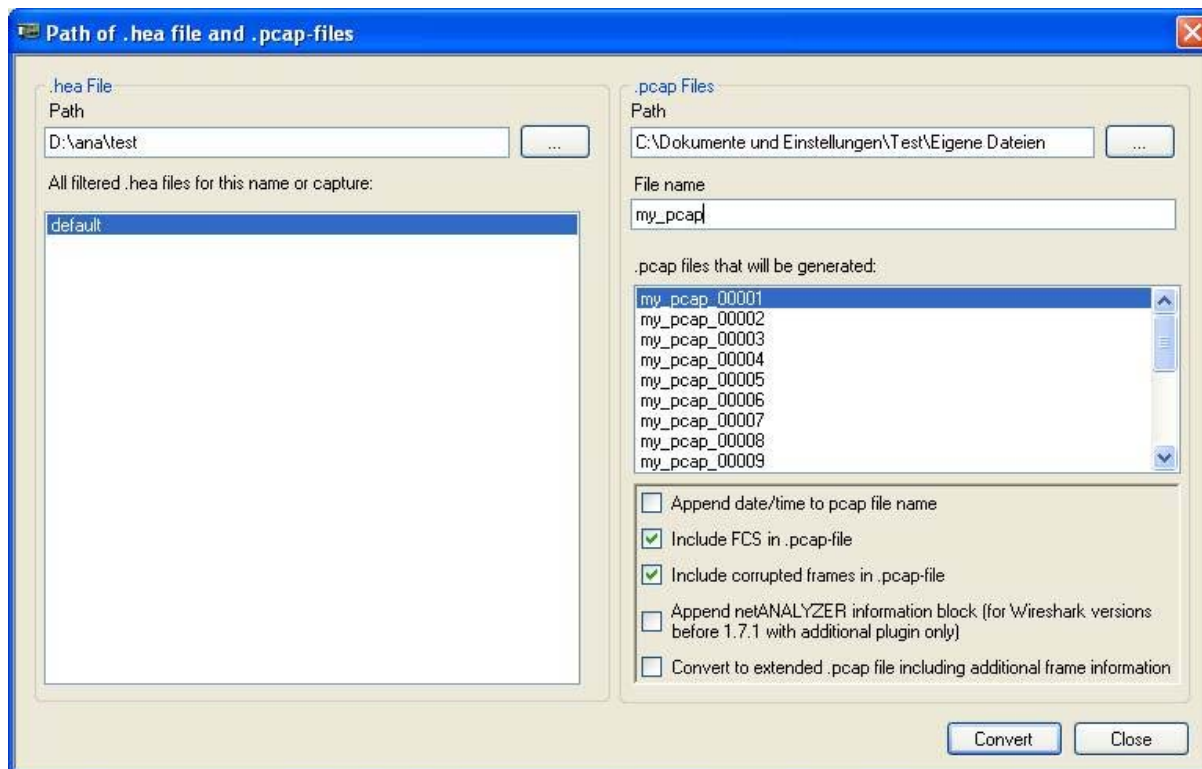


Figure 73: Path of .hea file and .pcap files

Control	Explanation
.hea File	
Path	Path to be selected by the operator, from which the netANALYZER must read the binary file (*.hea) for conversion. By default, here the last in the window File Settings defined path is displayed, where the netANALYZER / netSCOPE Device Driver has saved the binary file (*.hea). This path can be changed here, to gain access to elsewhere stored capturing data.
	Note: If the path defined in the window File Settings is changed here, the new path is displayed also in the window File Settings and the data captured at the next capturing will be saved under this new path.
	Selection of the source directory of the .hea files
All filtered .hea files for this name or capture	Edited list of .hea files in the selected directory

Table 39: Description Path of .hea file and .pcap files - .hea File

.hea File

1. To possibly change the path for the conversion:
 - Under **.hea File > Path** click to .
 - In the window **Search Folder** define the file location.

Control	Explanation
.pcap files	
Path	Path to be defined by the operator, under which the netANALYZER software shall save the WinPcap file (*.pcap).
	Selection of the destination directory of the .pcap files
File name	Systematic file name for the *.pcap files. The netANALYZER software still assigns for every file in addition an ongoing number in the file name.
.pcap files that will be generated Example for the building name:	Preview of the .pcap files that will be generated ① or ② selected file name ③ consecutive numerical code ④ time information, consisting of: <code>yyyymmddhhmmss</code> (start of the capturing of the hea-file, only if Append date/time to pcap file name is checked).
Append date/time to pcap file name	Date and time are added to the file name or not.
Include FCS in .pcap-files	Checkbox whether the Ethernet check sum must be with the PCAP file or not. (Some Wireshark-dissectors do not support FCS.) Note: If Convert to extended .pcap file including additional frame information is checked, Include FCS in .pcap-file is grayed-out, as in this case the FCS will be converted to the .pcap file. FCS = Frame Check Sequence (Ethernet check sum at the frame end for error detection) Can not be selected if Convert to extended .pcap file including additional frame information is checked, but is enabled.
Include corrupted frames in .pcap file	If this option is activated, also incorrect frames will be transferred into the .pcap file. If the option is deactivated only correct telegrams will be saved to the .pcap file.
Append netANALYZER information block (for Wireshark versions before 1.7.1 with additional plugin only)	For Wireshark versions before V1.7.1 the option requires to install the netANALYZER Wireshark plugin. Inserts the netANALYZER info block behind the Ethernet frame into the .pcap file. Thereby additional information for every telegram are available, as the receiving time, the receiving port or error information. Note: The .pcap file format with the info block behind the Ethernet frame is not supported any more by Wireshark versions beginning from V1.7.1. Can not be selected if Convert to extended .pcap file including additional frame information is checked, but is enabled.
Convert to extended .pcap file including additional frame information	Beginning with version 1.4.x.x, an extended pcap file format can be generated. Here the "netANALYZER frame info block" is in the 4 bytes ahead of the Ethernet frame. Thereby additional information for every telegram are available, as the receiving time, the receiving port or error information. Note: The extended .pcap file format generated by the netANALYZER software V1.4.x.x can be opened in Wireshark versions beginning from V1.7.1.
Convert	Conversion of binary files into WinPcap format.
Close	Close the window without starting a conversion.

Table 40: Description Path of .hea file and .pcap files - .pcap files

.pcap files

2. To change the path to store .pcap files:

- Under **.pcap files > Path** click to .
- In the window **Search Folder** define the file location, where to store WinPcap files.
- Data are saved in multiple .pcap-files, 50 MB each.

3. Via **Convert** convert the binary files to the WinPcap format.
➤ In the window **Conversion** the conversion process details are displayed.

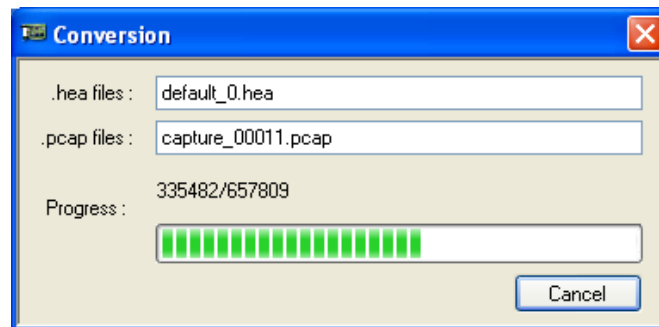


Figure 74: Conversion

Control	Explanation
.hea files	Display of the name of the currently created binary file
.pcap files	Display of the name of the currently converted WinPcap file
Progress	Progress bar for the conversion in Kbyte

Table 41: Description Conversion

4. After the conversion was completed successfully, the window **Path of .hea file and .pcap files** closes automatically.

9.1.3 Timestamp

The Figure hereafter shows for „Ethernet Mode“ or for „Transparent Mode“, where the timestamp for the associated data packet is taken.

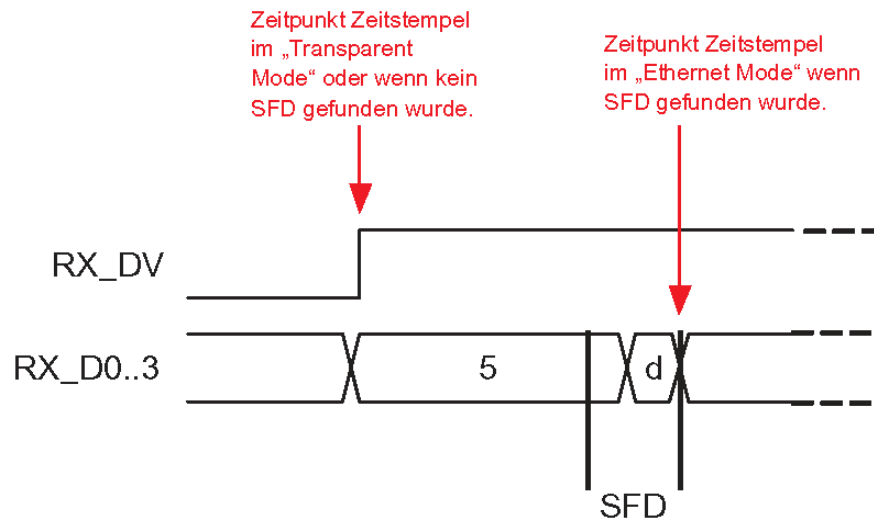


Figure 75: Message Timestamp-Point for „Ethernet Mode“ and „Transparent Mode“¹

„Ethernet Mode“ (Standard Capturing):

In „Ethernet Mode“ the time stamp is taken at the reception of the SFD (Start-of-Frame-Delimiter).

„Transparent Mode“ (SFD² is disturbed):

In „Transparent Mode“ the time stamp is taken at the always at the very front with the lateral growth, i. e. at the proper start of the frame. Here preamble and SFD are not interpreted.

Accuracy of the time stamping

Time stamps on port 0 and port 1 on the NANL-C500-RE card or NANL-B500E-RE or NANL-B500G-RE device can have an offset of up to 40 ns. After a settling time of approx. 100 ms after receiving the first telegram at one port the offset at this port is max. 8 ns.

Time stamps on port 2 and port 3 on the NANL-B500E-RE or NANL-B500G-RE device have always a max. offset of 8 ns, without settling.

Time stamps on port 2 and port 3 on the NANL-C500-RE card of the Rev. 4 and older have always an up to 70 ns offset.

¹ „DV“ = Data Valid, „D0..3“ = Data, „5 d“ = SFD identifier

² „SFD“ = Start-of-Frame-Delimiter

9.1.4 Input Signal as pseudo Frame

For GPIO events a special pseudo Ethernet frame is generated by the firmware. This allows Wireshark with a special dissector to display GPIO events within the frame list.



Note: A special MAC address is used, of the Hilscher range 00:02:A2:FF:FF:FF. This address must never be assigned to a real address.

Format of the Pseudo Frames (Length: 17 Bytes):

6 Bytes Destination MAC Address	6 Bytes Source MAC Address	Ethertype	ID	GPIO Number	Edge (pos/neg)
00:02:A2:FF:FF:FF	00:02:A2:FF:FF:FF	0x88FF	0x00	0x00 ... 0x03	0x00 ... 0x01

Table 42: Format of the Pseudo Frames

9.1.5 Determining Cycle Time and Forwarding Time (Capture Data Mode)

The parameters cycle time and forwarding time at the capturing-mode can be determined by the use of Wireshark from the captured and to the pcap format converted analysis data. The procedure, how to determine the parameters, varies with the different types of communication.

Cycle Time (Example PROFINET IRT)

The cycle time is the time difference between the time stamps of two consecutive frames of a cyclically occurring frame type (such as the Sync-frame).

1. Open in Wireshark the *.pcap file of the captured and into in the pcap format converted analysis data. (see section *Starting Data Capturing* on page 108 and section *Converting Binary Files into WinPcap Format* on page 109).
2. Take in Wireshark the time difference between the time stamps of two successive frames of a cyclically occurring frame type.

Forwarding Time (Example PROFINET IRT)

The forwarding time is the time difference between the time stamps of a cyclically occurring frame after and of a cyclically occurring frame before a device (e. g. Sync-frame).

1. Open in Wireshark the *.pcap file of the analysis data, captured after or before a device and converted into in the pcap format. (see section *Starting Data Capturing* on page 108 and section *Converting Binary Files into WinPcap Format* on page 109).
2. Take in Wireshark the time difference between the time stamps of a cyclically occurring frame after and of a cyclically occurring frame before a device.

9.1.6 Transparent Mode

The **Transparent Mode** is used with the data capturing to register any telegram data, i. e., any bits transmitted including the frame data, preamble and SFD (=Start of Frame Delimiter).



Note: The usage of the **Transparent Mode** only makes sense with a 100 Mbit connection.

The figure below shows the basic principle of an Ethernet frame (Ethernet telegram) in the in the **Standard Ethernet Mode** or in the **Transparent Mode**.

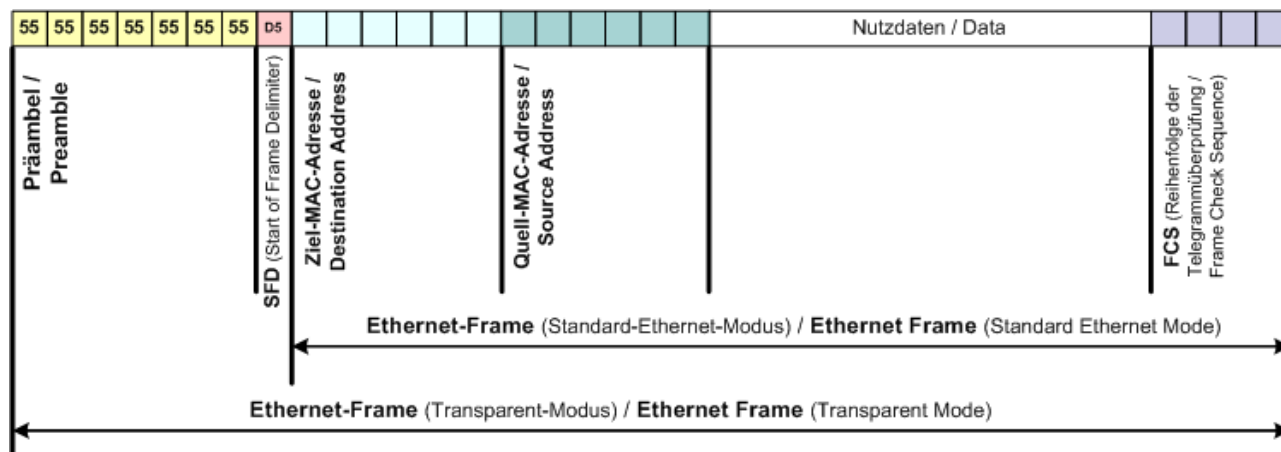


Figure 76: Basic Principle of an Ethernet Frame in the Standard Ethernet Mode or in the Transparent Mode

As during the **Standard Ethernet Mode** the preamble and the SFD (=Start of Frame Delimiter) are not included to the telegram, these parts are captured in the **Transparent Mode**.

0000	01 80 c2 00 00 0e 00 14	22 40 4f e4 88 cc 02 07	 "@O.....
0010	04 00 14 22 40 4f e4 04	09 07 70 6f 72 74 2d 30	..."@O... ..port-0
0020	30 31 06 02 00 14 08 41	42 72 6f 61 64 63 6f 6d	01.....A Broadcom
0030	20 4e 65 74 58 74 72 65	6d 65 20 35 37 78 78 20	Netxtre me 57xx
0040	47 69 67 61 62 69 74 20	43 6f 6e 74 72 6f 6c 6c	Gigabit Controll
0050	65 72 20 2d 20 50 61 6b	65 74 70 6c 61 6e 65 72	er - Pak etplaner
0060	2d 4d 69 6e 69 70 6f 72	74 0a 0a 53 49 4d 41 54	-Minipor t..SIMAT
0070	49 43 20 50 43 0c 23 53	49 45 4d 45 4e 53 20 41	IC PC.#S IEMENS A
0080	47 20 53 49 4d 41 54 49	43 20 50 43 20 2b 20 65	G SIMATI C PC + e
0090	6e 67 69 6e 65 65 72 69	6e 67 0e 04 00 80 00 80	ngineeri ng.....
00a0	10 14 05 01 c0 a8 0a 25	02 00 00 00 01 08 2b 06	%
00b0	01 04 01 81 c0 6e fe 08	00 0e cf 02 00 00 00 00	n.
00c0	fe 0a 00 0e cf 05 00 14	22 40 4f e4 fe 09 00 12	 "@O.....
00d0	0f 01 02 00 00 00 10 00	00 5a bb b9 68	Z..h

0000	55 55 55 55 55 55 55 d5	01 80 c2 00 00 0e 00 14	UUUUUUU.
0010	22 40 4f e4 88 cc 02 07	04 00 14 22 40 4f e4 04	"@O..... "@O...
0020	09 07 70 6f 72 74 2d 30	30 31 06 02 00 14 08 41	..port-0 01.....A
0030	42 72 6f 61 64 63 6f 6d	20 4e 65 74 58 74 72 65	Broadcom Netxtre
0040	6d 65 20 35 37 78 78 20	47 69 67 61 62 69 74 20	me 57xx Gigabit
0050	43 6f 6e 74 72 6f 6c 6c	65 72 20 2d 20 50 61 6b	Controll er - Pak
0060	65 74 70 6c 61 6e 65 72	2d 4d 69 6e 69 70 6f 72	etplaner -Minipor
0070	74 0a 0a 53 49 4d 41 54	49 43 20 50 43 0c 23 53	t..SIMAT IC PC.#S
0080	49 45 4d 45 4e 53 20 41	47 20 53 49 4d 41 54 49	IEMENS A G SIMATI
0090	43 20 50 43 20 2b 20 65	6e 67 69 6e 65 65 72 69	C PC + e ngineeri
00a0	6e 67 0e 04 00 80 00 80	10 14 05 01 c0 a8 0a 25	ng.....%
00b0	02 00 00 00 01 08 2b 06	01 04 01 81 c0 6e fe 08	+.....n..
00c0	00 0e cf 02 00 00 00 00	fe 0a 00 0e cf 05 00 14	
00d0	22 40 4f e4 fe 09 00 12	0f 01 02 00 00 00 10 00	"@O.....
00e0	00 5a bb b9 68		.Z..h

Figure 77: Ethernet Telegram (Ethernet Frame) in Wireshark in the Standard Ethernet Mode or in the Transparent Mode

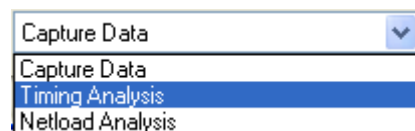
9.2 Timing Analysis

9.2.1 Starting Timing Analysis

1. Opening the Histogram Graph.
 - In the **netANALYZER** window select **Settings > Analysis Configuration > Graph Display** and check **Histogram**.

Or

2. Opening combined Histogram and History Graph.
 - In the **netANALYZER** window select **Settings > Analysis Configuration > Graph Display** and check both **Histogram** and **History**.
3. Activating the Ports for the Timing Analysis.
 - In the **netANALYZER** window check the analysis ports required.
4. Select Timing Analysis Mode.
 - In the **netANALYZER** window select **Timing Analysis**.



- The window **Timing Analysis** with four analysis windows is displayed.
5. Starting Timing Analysis.
 - In the **netANALYZER** window click on **Start**.
 - The analysis process of the received Ethernet frames starts.
6. Stopping Timing Analysis.
 - In the **netANALYZER** window click on **Stop**.

9.2.2 The Timing Analysis Window

On the subsequent pages the *Figure 78* and *Figure 79* show two examples about the Timing Analysis window.

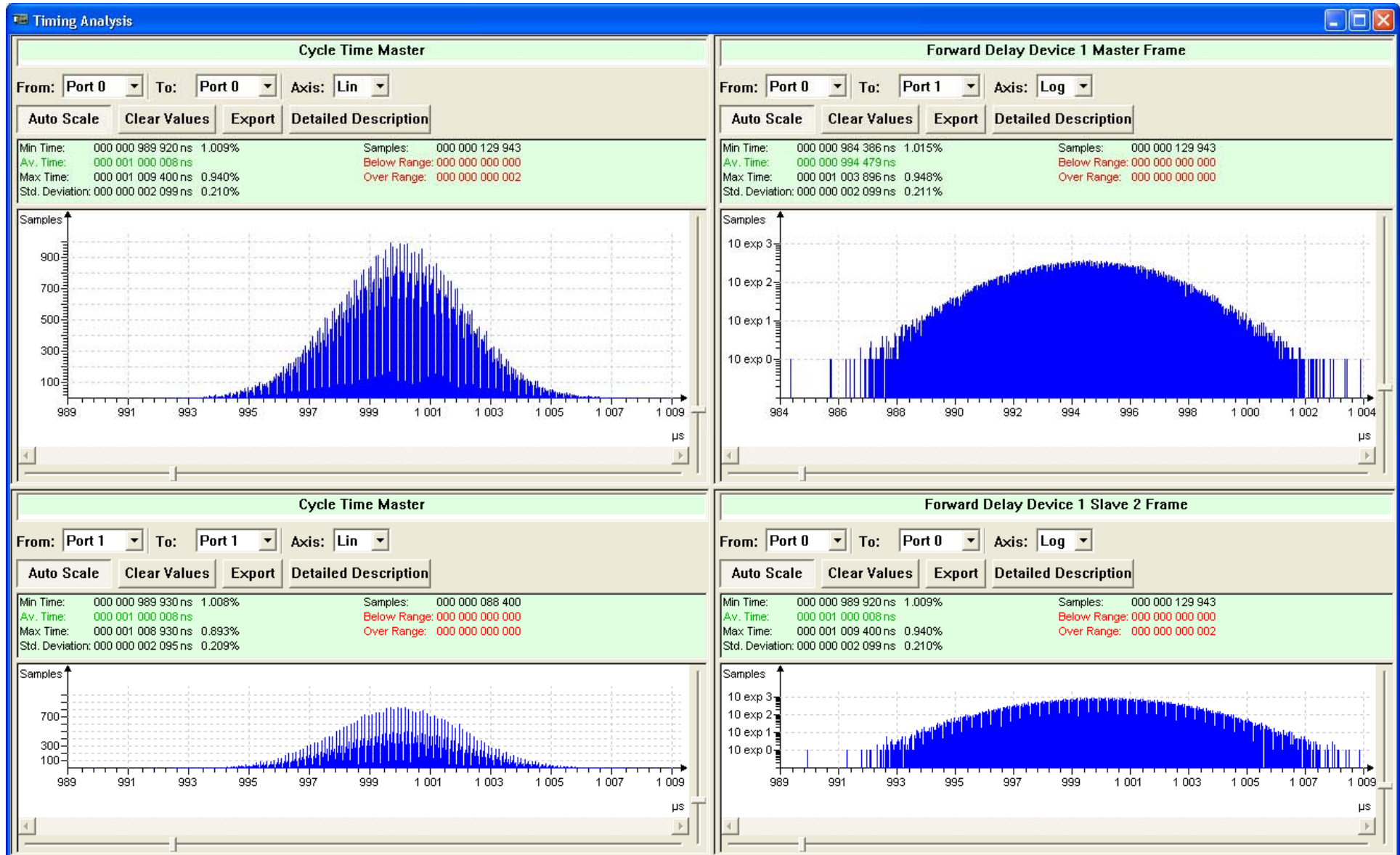


Figure 78: Timing Analysis with Histogram Graph (Example)

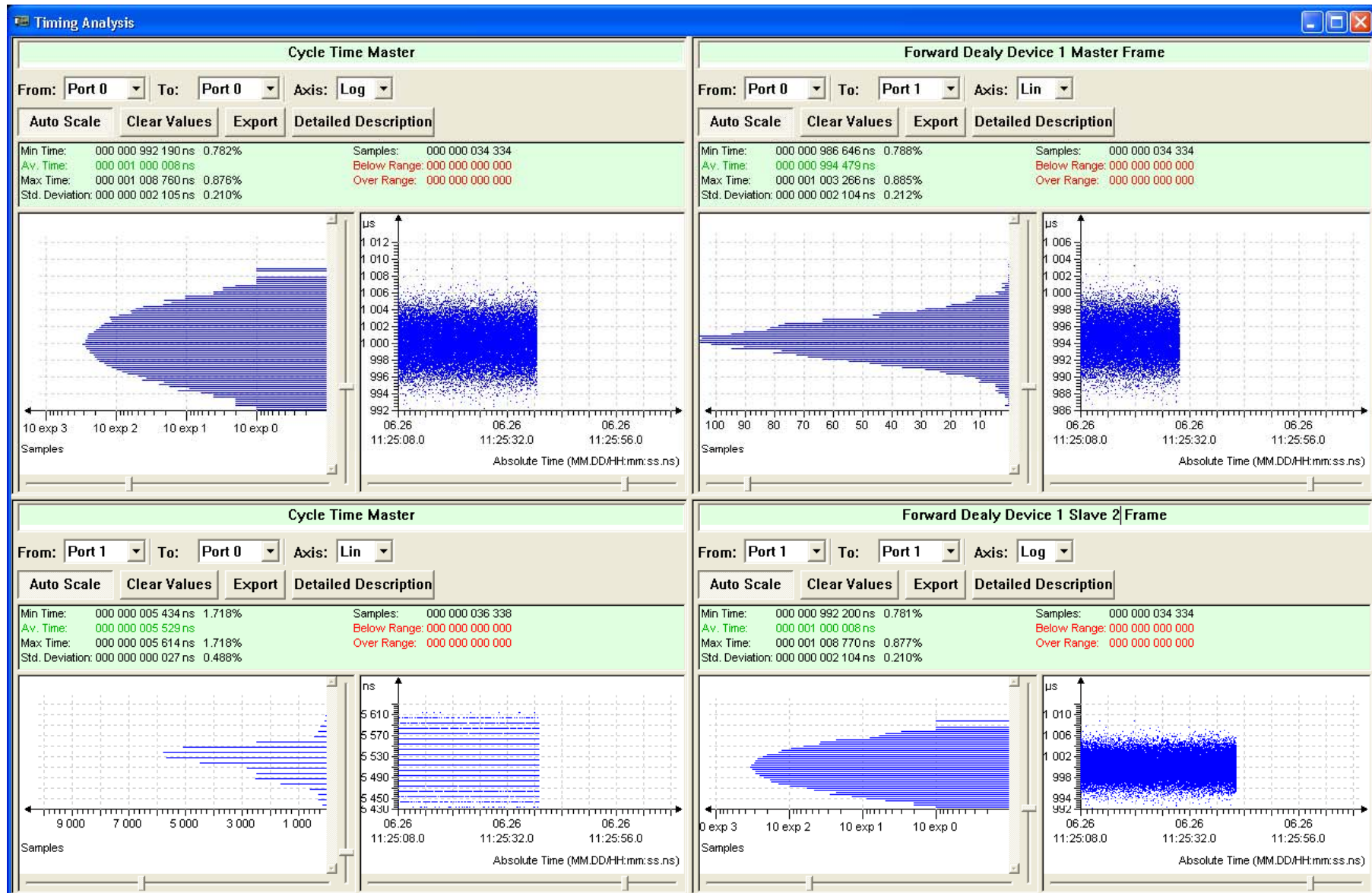


Figure 79: Timing Analysis with combined Histogram and History Graphs (Example)

9.2.3 Timing Analysis Window Detail Description

One analysis window in detail consists of the following components:



Figure 80: Timing Analysis Window with Histogram Graph

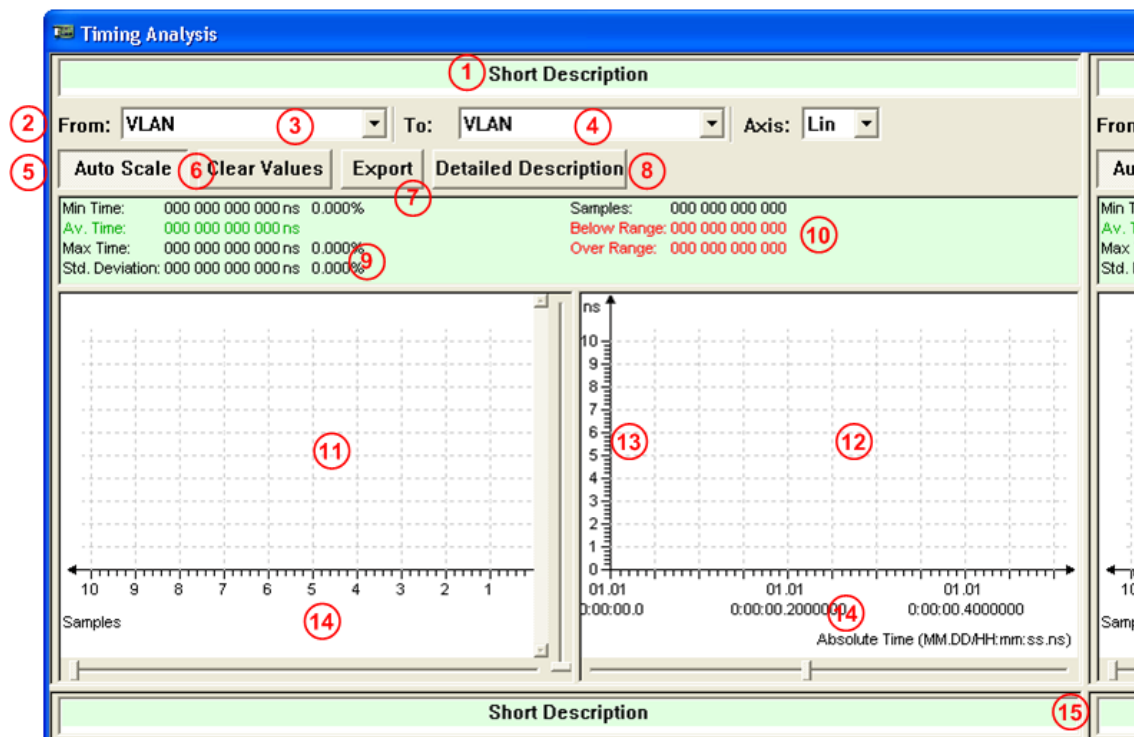
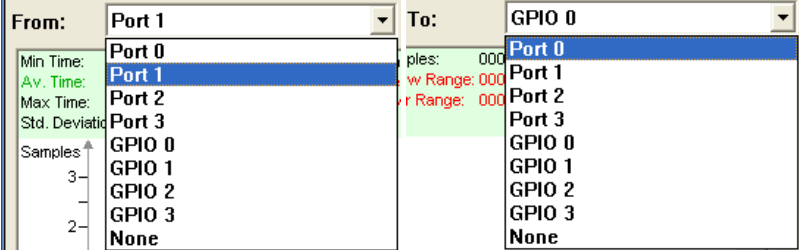
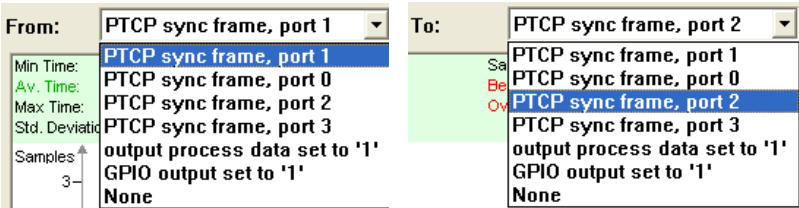
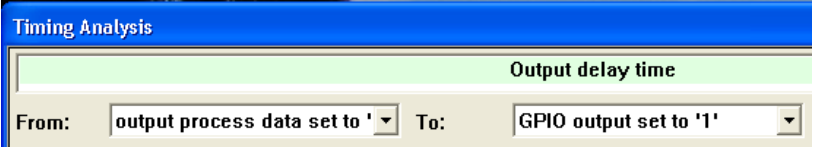
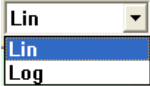
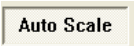


Figure 81: Timing Analysis Window with combined Histogram and History Graphs

Control	Explanation	Range of Value / Value
① Short Description	Here the user can enter an arbitrary short description for his histogram.	Text
Port or Event Selection ② (From) ③ (To)	Defines the analysis ports or events. The timing analysis is always carried out for frames or events between start port or start event From and stop port or stop event To.  Choice options: Port 0-3, GPIO 0-3, "None" Via "None" the appropriate timing analysis graph is disabled. When using the Extended Software Filters, under From / To the events can be selected, which were defined via the extended software filters. This requires that the Extended Software Filters will be created or loaded via Settings > Extended Software Filter Settings, and enabled via Settings> Configuration Analysis.  Example: „Forwarding Time, Sync Telegram“, Selection of the Events  Example: „Forwarding Time, Sync Telegram“  Example: „Output Delay Time“	Port 0, Port 1, Port 2, Port 3, GPIO 0, GPIO 1, GPIO 2, GPIO 3, None
④ Axis	 Selection for the linear or logarithmic scaling of the histogram sample axis. The time axis only can be displayed in linear mode.	
⑤ Auto Scale	Serves to switch between the automatic and manual scaling of the x-axis and the y-axis.  Click Auto Scale, to disable Auto Scale.  Click Auto Scale once more, to enable Auto Scale.	
⑥ Clear Values	The message is displayed: "Warning! All captured data in this window will be lost. Do you want to proceed?" Deletes all values recorded till now for the current histogram and starts with the analysis once more.	
⑦ Export	Saves the detailed description, the measured values and the histogram data into a CSV file.	

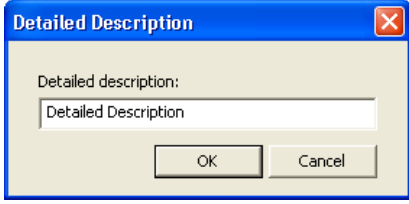
Control	Explanation	Range of Value / Value
Detailed Description 8	Detailed Description opens a text window, where a detailed description to the timing analysis window can be entered.  This description is saved in the CVS file, when "Export" is pressed.	Text
Measured Value Display 9 (left side)	At the left side the following values are displayed: - the minimum and maximum measured time (Min Time, Max Time), - the arithmetic mean value of the measured time (Av Time) and - the standard deviation of the measured time (Std. Deviation). The minimum and maximum measured time both are displayed in absolute value and as percent deviation from the arithmetic mean value of the measured time. The standard deviation is displayed in absolute value and in percent. $S = \sqrt{S^2} := \sqrt{\frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2}$ S: Standard deviation n: Number of samples X: Value of the sample X_average: Arithmetic Mean	Min Time, Av Time, Max Time, Std. Deviation
10 (right side)	At the right side the following values are displayed: - the number of measured values (Samples), as well as - the number of measured values below and above the display area of the histogram (Below Range, Over Range). The display area can be found via the zoom and pan sliders for the scaling of the X-axis or the Y-axis.	Samples, Below Range, Over Range
11 Histogram: (Frames / Time or Time / Frames)	The history graph shows the distribution function of all measurements as Frames / Time Diagram respectively for the timing analysis with Histogram and History as Time / Frames Diagram.	
12 History: (Time / Absolute Time)	The history graph shows the distribution function of all measurements as Time / Absolute Time Diagram.	
Scaling 13 X-Axis 14 Y-Axis	Zoom and pan sliders for the scaling of the X-axis or the Y-axis.	
15 Divider	The size of the individual windows can be varied about the divider. Therefore right-click to the divider and move with the pressed right mouse button on the desired position. 	

Table 43: Description Timing Analysis Window

9.2.4 Scaling in the Timing Analysis Window

You can expand or compress the graphical representation of both time axes. This is important especially for the X time axis within the history window. Therefore you must click on **Auto Scale** to deactivate it.

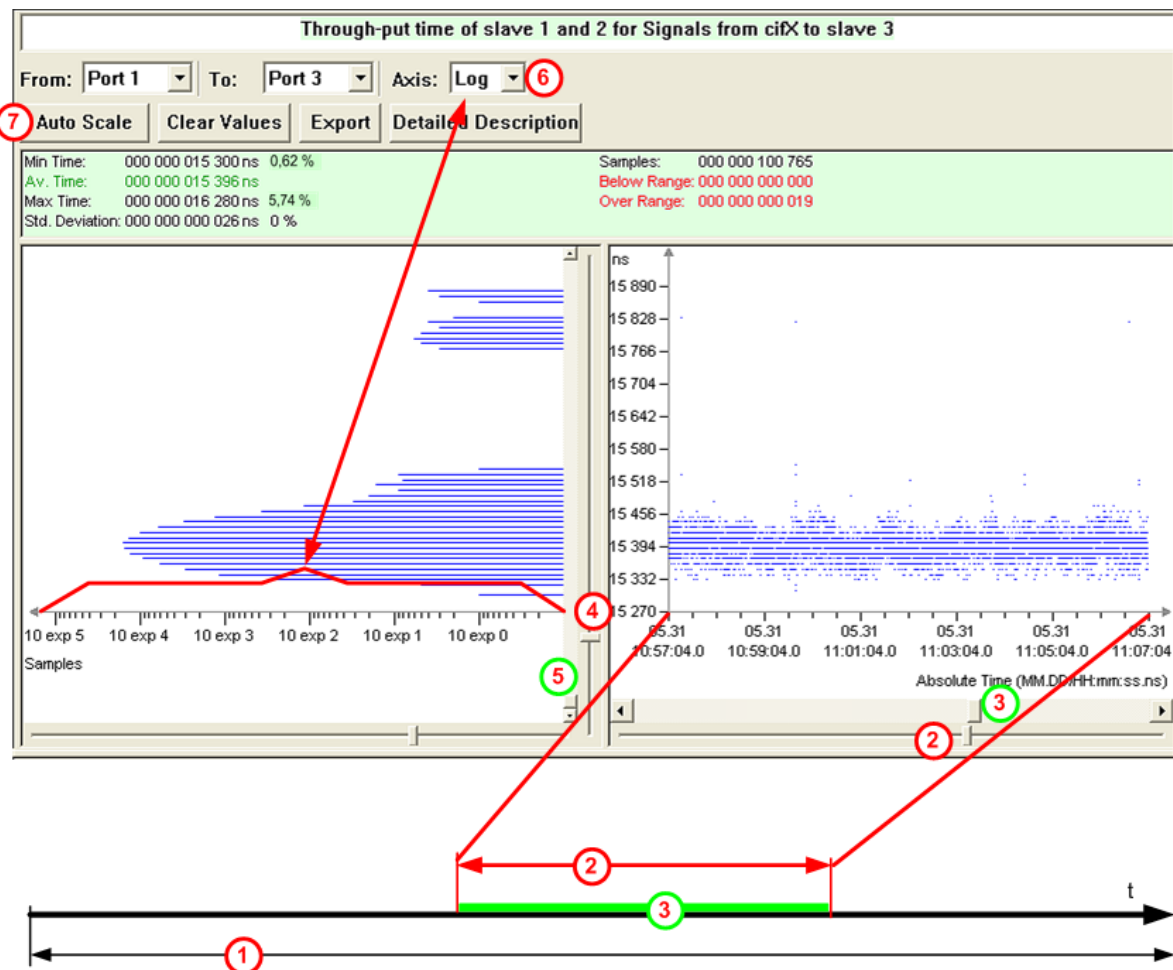


Figure 82: Timing Analysis, change Scaling

The time bar ① in Figure 82 displays the entire measuring time period.

The slider ② allows to change the width of the displayed time period.

The slider ③ allows to change the position of the displayed time period relative to the entire measuring time period.

This applies for the Y time axis accordingly: The width of the displayed time period is adjusted with slider ④ and the position on the time bar with slider ⑤. The measured events can very easily move outside of the displayed area. By clicking at **Auto Scale** ⑦ the display area is moved over the events again.

Within the histogram, the sample axis can be switched between linear and logarithmic scaling by selecting **Axis** ⑥ and vice versa. The time axis only can be displayed in linear mode.

All three axes in Figure 82 can be adjusted with **Auto Scale** ⑦ in such a manner, that all measuring events are located within the display area.

9.2.5 Zooming in the Timing Analysis Window

In Timing Analysis window you can zoom in any area in the history or the histogram graph.

- Therefore disable **Auto Scale** and drag the required area in the window.
- The desired area appears as a shaded field and is zoomed in upon dropping.

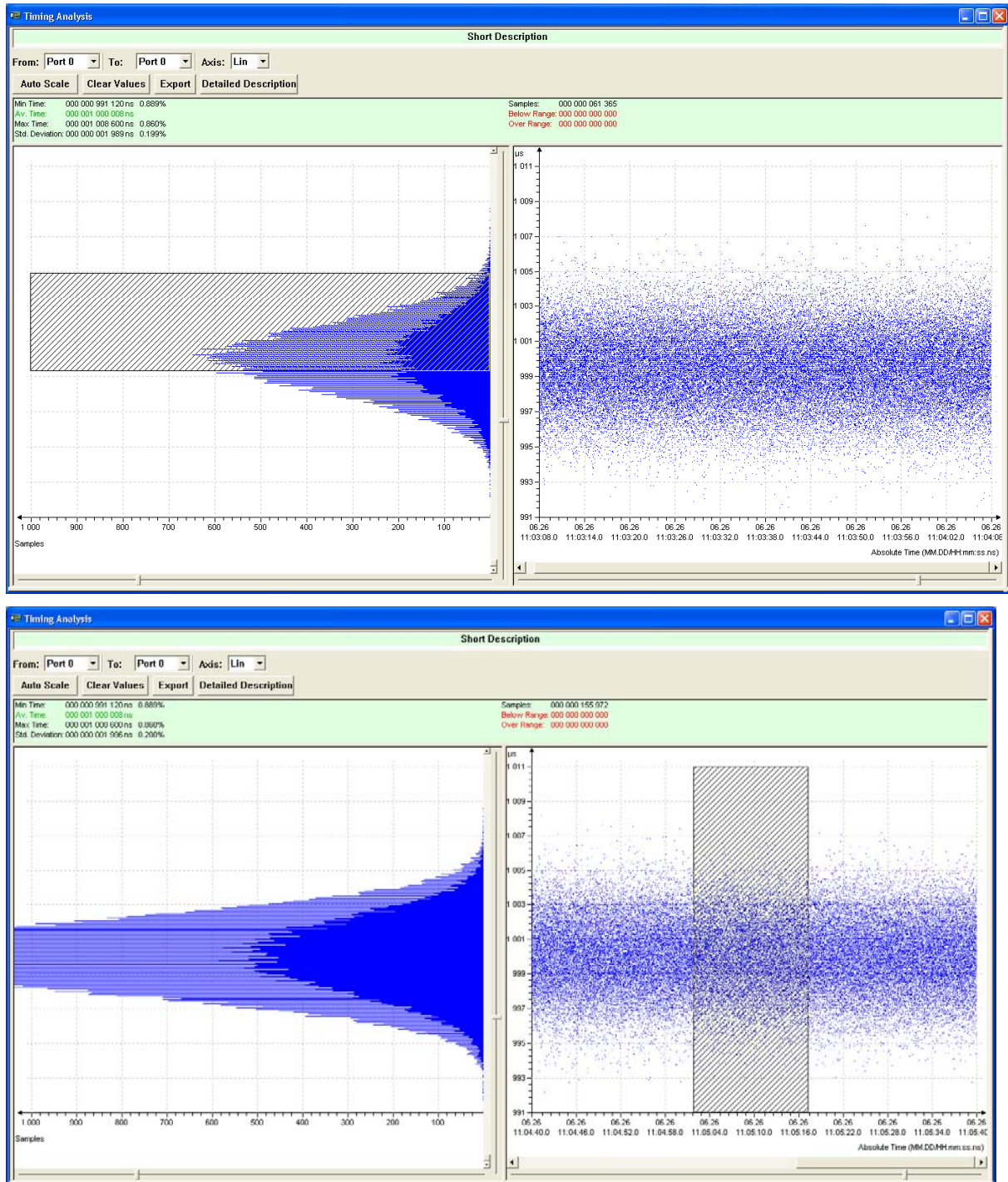


Figure 83: 'Drag and Zoom' in the Timing Analysis Window, top Histogram Graph, below History Graph

9.2.6 Examples for the Possibilities of the Timing Analysis



Note: Normally certain cyclical frames form the base for the timing analysis, so e.g. the Sync telegram at PROFINET or MDT0 at sercos. It is of importance that only these frames are brought to the timing analysis. Therefore before the start of the analysis a corresponding filter must be set, which prefilters possible acyclic or additional cyclical telegrams and exclusively lets through the frame to be analyzed.

9.2.6.1 Cycle Time Measurement

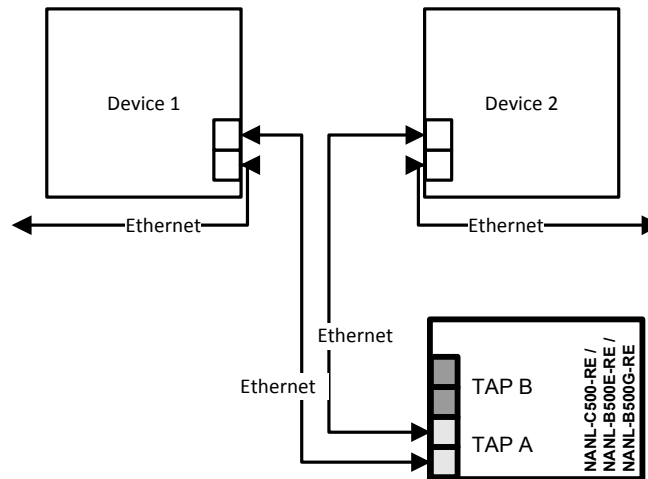


Figure 84: Application Case1 – Example Cycle Time Measurement

For the cycle time measurement, it is sufficient to insert one TAP of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE into transmission distance. Here the differences between two successive frame times are formed, and gives the cycle time as a result. In the port selection as start and as destination port correspondingly the same port must be selected.

9.2.6.2 Forwarding Time Measurement

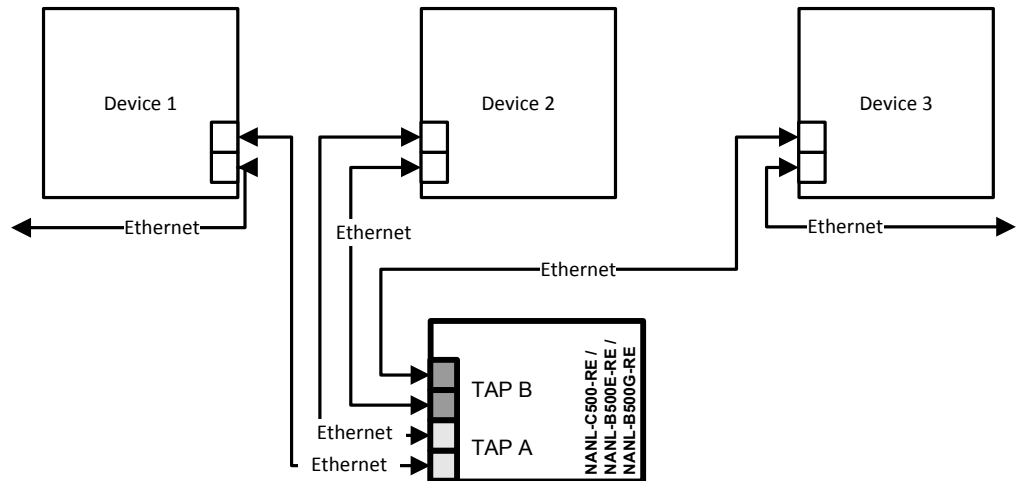


Figure 85: Application Case2 - Example Forwarding Time Measurement

For the forwarding time measurement the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE must be inserted before and behind the device to be examined. Here the time difference between the telegram coming in on the one side of the device is measured up to the next telegram on the other side of the device. The port selection correspondingly must be carried out from a port of the first TAP to a port of the second TAP: Difference of port 0/1 to port 2/3 or for measurement to the opposite direction port 2/3 to port 0/1.

9.2.6.3 Stack Operating-Time Measurement

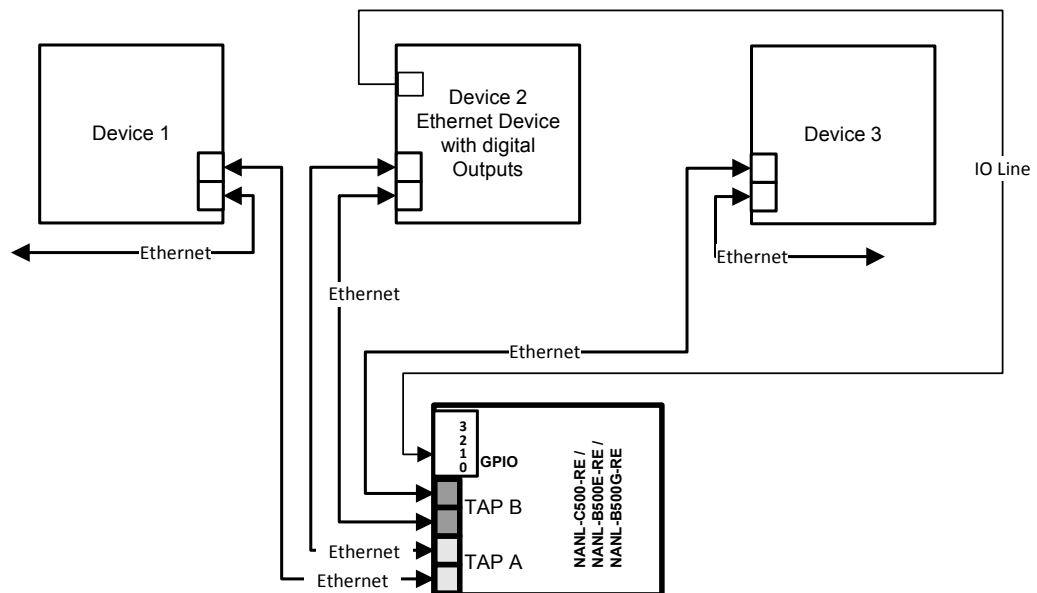


Figure 86: Application Case 4 – Recording of the Runtime in the Device – Example Stack Operating-Time Measurement

For stack operating-time measurement the difference between a port of the Ethernet channel and a GPIO can be formed. Here, e. g. a cyclical process data frame on port x becomes supervised as well as the appearance of a digital switching event on GPIO y after this frame was processed in the software stack.

9.2.6.4 Response-Time Measurement

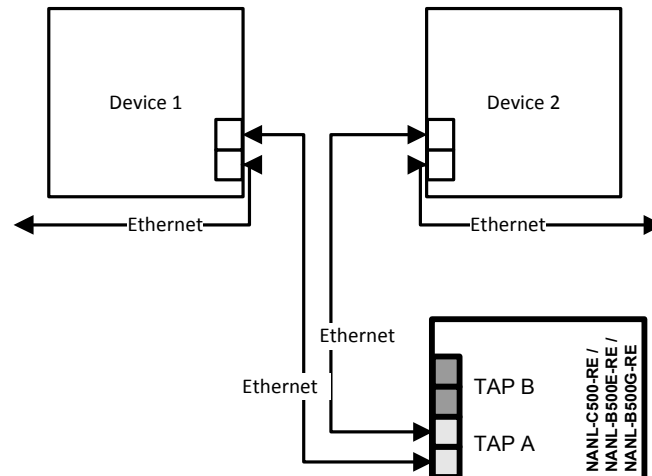


Figure 87: Application Case 1 – Example Response-Time Measurement

For response-time measurement the difference in time between two different ports on the same TAP is measured. Here, for example, the incoming frame on port 0 is recorded, and the outgoing response frame on port 1.



Note: Because of the auto-crossover function of most of the RTE systems, the assignment of port 0 and 1 or port 2 and 3 can change between different test runs.

One effect of the port interchanging is, that for wrongly selected ports the response time is measured incorrectly, because the measurement values are taken from the wrong ports.

9.2.7 Determining Cycle Time and Forwarding Time

The parameters cycle time or forwarding time can be found out at the data capturing mode (Capture Data) in the **netANALYZER** timing analysis window.

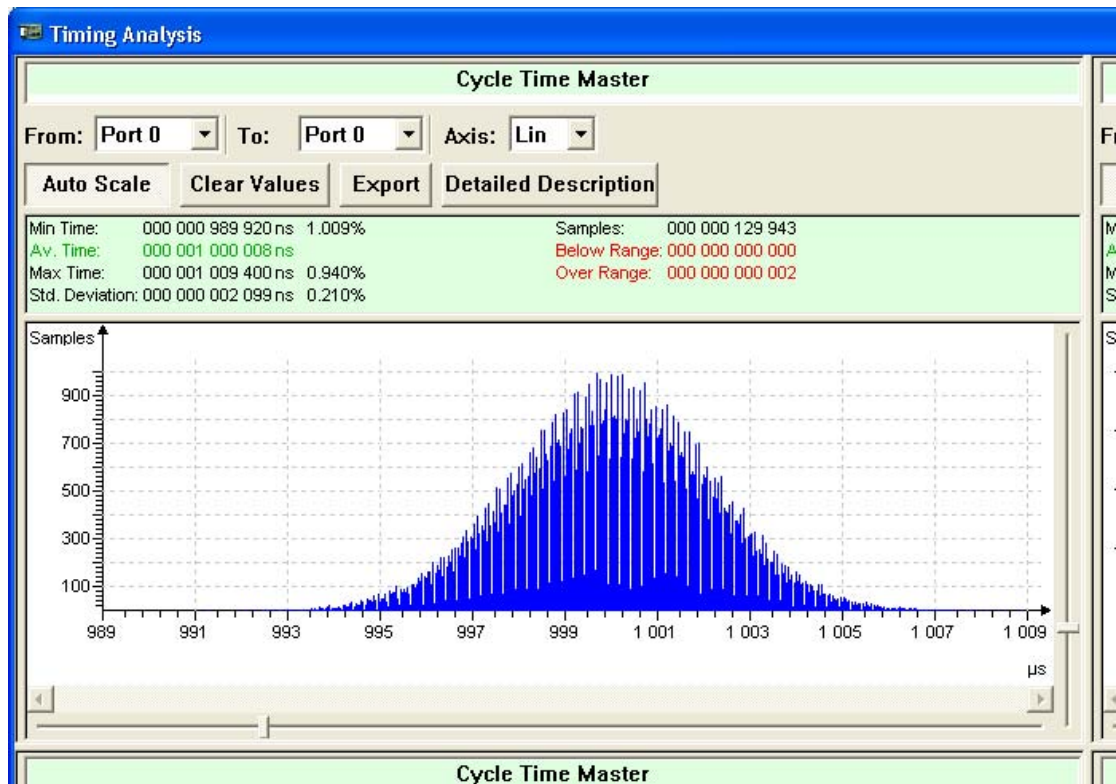


Figure 88: Timing Analysis Window

Cycle Time

- To find out the cycle time, select at **Start Port** and at **Stop Port** each the same port.

Forwarding Time

- To find out the forwarding time, select at **Start Port** and at **Stop Port** each the port in front of or after the device, for which the forwarding time shall be found out.

9.3 Netload Analysis

The **Netload Analysis** is used to measure the netload of different protocols transferred over the Ethernet line. To identify various frame types the **Extended Software Filters** are required (see also section *Extended Software Filters* on page 97).

A number of frames per time overview of the network is provided as textual and graphical statistics display, including export of the measured data to CSV. The identified frame types are counted in a statistics window and displayed graphically in a network load diagram, one colored line for every frame type over the capture time, as shown in the example in *Figure 89: Netload Analysis with Extended Software Filters VLAN_priorities* on page 129.

For analytical purposes the Netload Analysis data are captured. For more refer to section *Capturing the Netload Analysis Data* on 133.

9.3.1 Starting Netload Analysis

1. Loading and activating the Extended Software Filters
 - Load via **Settings > Extended Software Filter Settings > Load/Add Tree** a file for the extended software filters.
 - Select **Settings > Analysis Configuration > Graph Display** and check **Use Extended Software Filters**.
2. Activating the Ports for the Netload Analysis.
 - In the **netANALYZER** window check the analysis ports required.
3. Select Netload Analysis Mode.
 - In the **netANALYZER** window select **Netload Analysis**.



- The window **Netload Analysis** is displayed.
4. Starting Netload Analysis.
 - In the **netANALYZER** window click on **Start**.
 - The analysis process of the received Ethernet frames starts.
 5. Stopping Netload Analysis.
 - In the **netANALYZER** window click on **Stop**.

9.3.2 The Netload Analysis Window

The **Netload Analysis** window consists of two parts.

- In the upper part under **Frame Statistics** a textual display of the collected statistical information is displayed. Here for every defined filter information like overall frame count and current average load are displayed. Each entry can individually be selected to be displayed in the graph. The color of each displayed parameter can be selected (by right clicking on the filter name).
- The lower part of the window under **History** shows a graphical history of the measured net loads. Each of the selected entries is represented by a line with the same color as the entry in the textual display. The x-axis displays the absolute time (including the date, when the capture runs longer than 1 day), the y-axis displays the average frame load in 1/s. The update interval of the graph is 1 second, which means every second a new value is displayed. The graph is completely zoom- and pan-able in x- and y-axis by sliders.
- All displayed information (textual and graphical) can be exported to a CSV data file at any time during the analysis process.

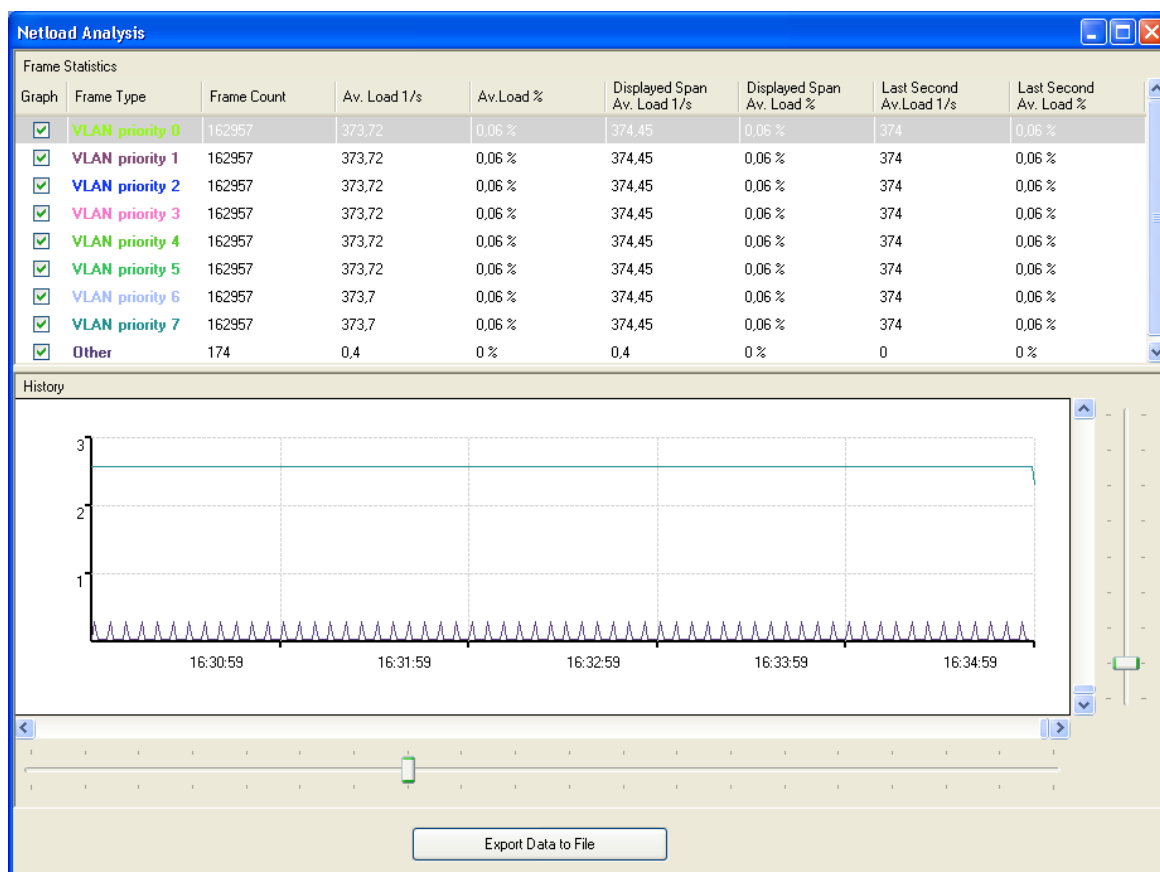


Figure 89: Netload Analysis with Extended Software Filters VLAN_priorities

Control	Explanation	Range of Value / Value
Frame Statistics		
Graph	Check the filter entry if the filtered frames shall be displayed as a graph in the history.	checked, unchecked

Control	Explanation	Range of Value / Value
Frame Type	Types of telegrams for which an identification entry has been created in the extended software filter settings. The frame type "Other" is always displayed. Among this, all the other telegrams are indicated.	Text
Frame Count	Total frame count of a filter entry per second. The measured distance is 1 second.	Frames in 1/s
Av. Load 1/s	Current average frame-load in 1/s	Frames in 1/s
Av. Load %	Current average frame-load as a percentage of max. transmitted bandwidth (100 % = 100 Mbit/s)	Frames in %
Displayed Span Av. Load 1/s	Current average frame-load during the indicated period of time in 1/s	Frames in 1/s
Displayed Span Av. Load %	Current average frame-load during the time period displayed as a percentage of max. transmitted bandwidth (100% = 100 Mbit/s)	Frames in %
Last Second Av. Load 1/s	Current average frame-load during the last second in 1/s	Frames in 1/s
Last Second Av. Load %	Current average frame-load during the last second in percentage of maximum. transmitted bandwidth (100% = 100 Mbit/s)	Frames in %
History		
Y-axis	Average frame-load in 1/s, Update interval = 1 second.	Frames in 1/s
X-axis	Absolute time (including indication of the date if the recording is longer than 1 day).	absolute Time
Sliders	Panning and zooming the graphic in the X and Y directions.	
CSV Export		
Export Data to File	Refer to section <i>CSV Export</i> on page 132.	CSV file

Table 44: Description Netload Analysis Window

9.3.2.1 Color, Line Style and Line Width of the Graph

The color, line style and line width of a filter entry's graph can be changed individually.

- To change the graph's style, click in the **Netload Analysis** window under **Frame Statistics** with the right mouse button to the corresponding filter entry.
- The configuration window for the color, line style and line width appears.

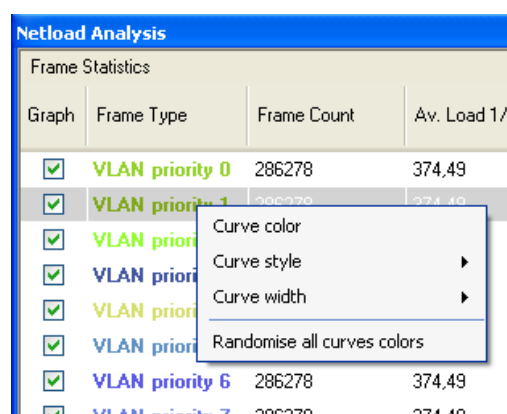


Figure 90: Color, Line Style and Line Width of the Graph

- About **Curve color**, the color of a filter entry and the associated graph are defined.

- About **Curve style**, the line style of a filter entry and the associated graph are defined.
- About **Curve width**, the line width of a filter entry and the associated graph are defined.
- About **Randomize all curves colors**, the colors of all filter entries are assigned at random again. In order to achieve a suitable color distribution trigger that option if necessary several times.

9.3.2.2 Linear, logarithmic or percentage Display the of Netload

The netload graph can be shown in linear, logarithmic or percentages* display (* 100% = 100 Mbit/s).

- Therefore click in the **Netload Analysis** window under **Frame Statistics** with the right mouse button to the corresponding graph.
- The configuration window for the display mode appears.

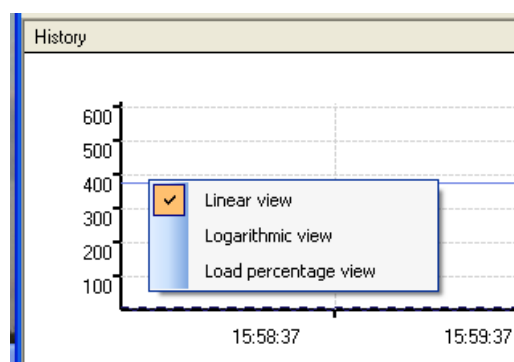


Figure 91: Linear, logarithmic or percentage Display of the Netload

- Select and check the desired display mode.

9.3.2.3 Tooltip Display for Frame Types

In the graphic display on each graph the frame type can be displayed as the name of the filter or of the filtered frame.

- Therefore move the mouse over the respective graph.

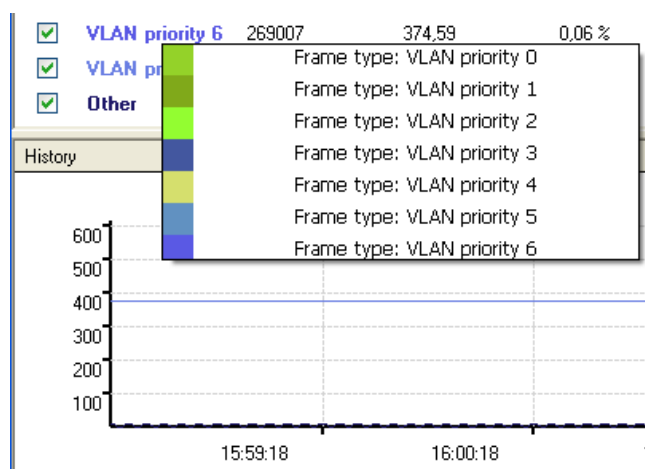


Figure 92: Tooltip Display for Frame Types

9.3.2.4 CSV Export

The CSV export can include all analysis data since the beginning of the capturing time, or only a portion of it.

- In order to export all or a part of the analysis data into a CSV file, click in the **Netload Analysis** window to **Export Data to File**.

➤ The **Export to CSV File** query appears.

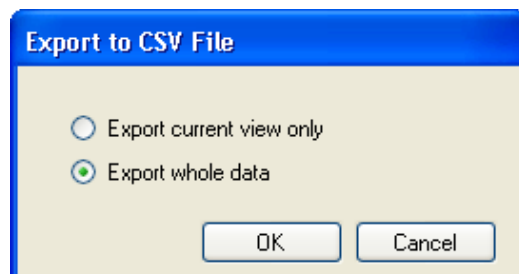


Figure 93: Query CSV Export

Element	Explanation
Export current view only	Only the currently displayed data are exported.
Export whole data	All the data since the beginning of the capturing session are exported.

Table 45: CSV Export Options

- Select **Export current view only**, to export all the currently displayed data.
- Select **Export whole data**, to export all data since the beginning of the capturing session.
- Click on **OK** and select the location for the CSV file.
- The exported CSV file is saved. It contains all data for all filter entries.

Structure of the CSV export file

- The upper part of the open CSV file containing the frame statistics data from the **Netload Analysis** window.
- The lower part of the CSV file contains the list of all values of the total number of frames measured every second. The total number of frames includes all frames of all frame types with an identification entry in the extended software filter settings, as well as those listed under "Other" frames.

	A	B	C	D	E	F	G	H	I
1	Graph	Frame Type	Frame Count	Average Load	Average Load(%)	Displayed Average Load	Displayed Average Load(%)	Last second Average Load	Last second Average Load(%)
2									
3		1 VLAN priority 0	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
4		1 VLAN priority 1	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
5		1 VLAN priority 2	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
6		1 VLAN priority 3	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
7		1 VLAN priority 4	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
8		1 VLAN priority 5	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
9		1 VLAN priority 6	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
10		1 VLAN priority 7	303924	374,1319372	0,06%	374,34	0,06%	375	0,06%
11		1 Other	324	0,398845592	0%	0,4	0%	1	0%
12									
13	Frame Type	Date Time	Count						
14									
15	VLAN priority 0	15:51:21 04.04.2012	374						
16	VLAN priority 0	15:51:22 04.04.2012	376						
17	VLAN priority 0	15:51:23 04.04.2012	374						
18	VLAN priority 0	15:51:24 04.04.2012	376						
19	VLAN priority 0	15:51:25 04.04.2012	374						
20	VLAN priority 0	15:51:26 04.04.2012	376						
21	VLAN priority 0	15:51:27 04.04.2012	374						
22	VLAN priority 0	15:51:28 04.04.2012	376						
23	VLAN priority 0	15:51:29 04.04.2012	374						

Figure 94: Example CSV Export of Measuring Data during the Netload Analysis

9.3.3 Capturing the Netload Analysis Data

For analytical purposes the Netload Analysis data are captured.

- To access the captured netload analysis data, click in the window **netANALYZER > Stop** and then **Convert**.
- Save the data in the window **Path of .hea file and .pcap files** as *.pcap files as described in section *Converting Binary Files into WinPcap Format* on page 109.

10 Troubleshooting, Status Messages and Error Codes

10.1 Notes about Troubleshooting

General

- Check if the preconditions are served for the operation of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE or NANL-B500G-RE:

Further information to this you find in section *System Requirements* on page 25.

Link is not recognized



Note: For 10-Mbit/s-connections and for increased bus load the PHY (physical interface) can not correctly detect the link. If in such a case in the **netANALYZER** main window under **Link DOWN** is displayed, for troubleshooting the speed must be set manually to 10 Mbit/s in the **PHY Settings** dialog.

LINK-LED

- Check using the LINK LED status if a connection to the Ethernet is established.

Further information to this you find in chapter *LEDs* on page 140.

Cable

- Check that the pin occupation of the used cable is correct.

Analyzer Device NANL-B500E-RE or NANL-B500G-RE

- Check that the power supply of the device is connected to the mains voltage.

Host Connecting Interference (NANL-B500G-RE)

The Ethernet connection from the analyzer device NANL-B500G-RE device to the PC is a saved connection without loss. Transmission errors on the host Gigabit interface cable (such as EMC interference or bad connections) do not cause any data loss. However, to strong interference can lead to a disconnection.

Device is not accessible (NANL-B500G-RE)



Note: In case of problems due to incorrect settings of the IP address (e. g. device is not accessible), restart your device. While turning on your device press the REC button for about minute. Then the default setting for the IP address of your device (DHCP server mode) is restored.

netANALYZER Software

For possible error messages during software start refer to section *Verification for Hardware and Device Driver* on page 78.

10.2 Status Bar Messages

The following table lists all status messages, which can be displayed in the status bar.

Significance of the color of the text status messages:

Black: Info message

Red: Error message

Green: Function enabled

Status Bar Description	Message Type	Description
GPIO Message		
GPIO: Start/Stop manual	Info message	Manually starting and stopping of the capturing process
GPIO: Start on event	Function enabled	The start of the capturing process, is triggered by a GPIO event.
GPIO: Stop on event	Function enabled	The stop of the capturing process, is triggered by a GPIO event.
GPIO: Start/Stop on event	Function enabled	The start and stop of the capturing process, are triggered by an event.
Status Message		
<i>Start of the Software</i>		
Status: Error in driver	Error message	The hardware is not installed or not compatible.
Status: Proceeding without device	Info message	The application has been started without netANALYZER device found. For testing this, remove the netANALYZER device from the PC or disable it from the Device Manager.
Status: Application ready	Info message	The application has been launched and everything is OK.
Status: Error in registry	Error message	Error reading/writing registry values. The necessary entries in the registry were faulty or absent.
Status: dll or driver not available	Error message	netANALYZER_API.dll or driver not found.
Status: Error set port configuration!	Error message	Error when calling the driver function for setting port configuration.
<i>Data Capturing</i>		
Status: Capture Data ready	Function enabled	The application is ready for the capturing data mode.
Status: Capture in progress	Function enabled	The application is in the capturing data mode.
Status: Capture stopped manually	Info message	The capturing data process was manually stopped.
Status: Capture stopped automatically	Info message	The capturing data process was automatically stopped by the application.
Status: Error creating file!	Error message	Failed to create the capture file.
<i>Timing Analysis</i>		
Status: Timing Analysis ready	Function enabled	The application is ready for the Timing Analysis mode.
Status: Timing Analysis not ready	Error message	The Timing Analysis mode has been selected but the Timing Analysis window could not be shown.
Status: Timing Analysis in progress	Function enabled	The application is in the Timing Analysis mode.
Status: Timing Analysis stopped manually	Info message	The Timing Analysis process was manually stopped.
<i>Net Load Analysis</i>		
Status: Net Load Analysis ready	Function enabled	The application is ready for the Net Load Analysis mode.
Status: Net Load Analysis in progress	Function enabled	The application is in the Net Load Analysis mode.
Status: Net Load Analysis stopped manually	Info message	The Net Load Analysis process was manually stopped.

Status Bar Description	Message Type	Description
<i>Further Messages</i>		
Status: Error, can't open directory	Error message	Access to the specified directory was denied. (Example: it does not exist)
Status: Successfully loaded settings	Info message	All settings could be loaded successfully. (The non-existing directory in the „can't open directory error“ has been successfully created.)
Status: preparing start of Firmware	Info message	Starting the capturing or data analysis process.
Status: preparing stop of Firmware	Info message	Stopping the capturing or data analysis process.
Status: File not found	Error message	The specified file could not be found.
Status: Can't open file	Error message	The specified file could not be opened.
Status: Converting data	Info message	The conversion of captured data was proceeded.
Status: Capture stopped from GPIO	Info message	The conversion of captured data was stopped by a GPIO event.
Status: Conversion completed	Info message	The conversion of the captured data was completed
Status: Mode not available	Error message	The selected mode could not be initialized correctly.
Status: Mode available	Info message	The selected mode has been initialized.
Status: Error: "XXXX"	Error message	An error has been occurred, the error code of which is XXXX.
Status: Error	Error message	An error has been occurred. The error code could not be represented yet.

Table 46: Status Bar Messages

10.3 Overview Error Codes

Error Codes	Type	Range
netANALYZER / netSCOPE Device Driver Errors	Generic Errors	Warnings
	Toolkit Errors	Warnings
	Driver Errors	Warnings
	Transport Errors*	Warnings
	Transport Header State Errors*	Warnings
	Marshaller Target Errors*	Errors
*only for NANL-B500G-RE		
Capturing Errors	Errors	

Table 47: Overview Error Codes and Ranges



The Error Codes are described in the **Driver Manual netANALYZER API, Windows XP/Vista/7/8, V1.x** in the chapter **5 Error List**. The manual file *netANALYZER API Windows DRV XX EN.pdf* is on the netANALYZER product DVD.

10.4 Important Error Codes, Causes and Troubleshooting

Value	Error Code (Definition)	Description	Possible Causes	Troubleshooting
Generic Errors (for NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE)				
0x80200003	NETANA_OUT_OF_MEMORY	Out of memory	The available storage capacity of central memory is full.	Upgrade the storage capacity of the central memory.
				Close all other open applications on the PC.
				Diminish the value under Memory Limit for Timing and Netload Analysis in the netANALYZER Configuration dialog, see section <i>Analysis Configuration</i> on page 106.
Driver Errors (for NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE)				
0x80220002	NETANA_DRIVER_NOT_RUNNING	netANALYZER / netSCOPE Device Driver is not running	The netANALYZER / netSCOPE Device Driver is not installed.	Install the netANALYZER / netSCOPE Device Driver.
			The netANALYZER / netSCOPE Device Driver is installed, but the netANALYZER hardware is not installed in the PC or not connected.	The netANALYZER hardware installed in the PC and connect.
			The netANALYZER device is disabled in the device manager.	Enable the netANALYZER device in Device Manager.
0x80220003	NETANA_DEVICE_NOT_FOUND	Device with the given name does not exist	The netANALYZER device was removed from the PC during operation of the netANALYZER software.	Update the netANALYZER Software device list, see section <i>Scanning for changed netANALYZER Hardware Installation</i> on page 82.
0x80220004	NETANA_DEVICE_STILL_OPEN	Device is still in use by another application	The netANALYZER device was already open in another instance of the netANALYZER software.	Close the netANALYZER device in the other instance of the netANALYZER software or select another device.
0x80220007	NETANA_FILE_OPEN_ERROR	Error opening file	Error during the attempt to open the .hea-file to convert it. The read access to the drive has been denied by Windows 7, there are no reading permissions.	Ask for reading rights to the directory or ask the administrator of your PC to move the .hea file to another directory.
0x80220009	NETANA_FILE_CREATION_FAILED	Error creating file	At the start of the capturing session, the error message Error creating file appears, that means, that the .hea file can not be created.	Reduce the maximum number of .hea-files before you start the capturing session (see section <i>Performing File Settings</i> on page 87. The netANALYZER software reserves for each .hea file a storage area of 1GB. Alternatively, expand the storage capacity of the hard disk.
0x8022000A	NETANA_FILE_WRITE_FAILED	Error writing file	An error occurs in the file during the current capturing session. For example, the USB connection to the external drive is disconnected or the network drive fails.	Do not interrupt the USB connection during capturing. Re-establish the network drive and start a new capturing session.

Value	Error Code (Definition)	Description	Possible Causes	Troubleshooting
Transport Errors (only forNANL-B500G-RE)				
0x8023000B	NETANA_TRANSPORT_RECV_TIMEOUT	Timeout while receiving data	The device is no longer accessible over the network connection.	Check the network connection to the device. Is the Ethernet cable connected correctly? By help of the Ethernet Device Configuration program check if the IP settings of the device are correct.
0x8023000C	NETANA_TRANSPORT_SEND_TIMEOUT	Timeout when sending data	The device is no longer accessible over the network connection.	Check the network connection to the device. Is the Ethernet cable connected correctly? By help of the Ethernet Device Configuration program check if the IP settings of the device are correct.
0x8023000D	NETANA_TRANSPORT_CONNECT	Could not communicate with the device / no answer	The device is no longer accessible over the network connection.	Check the network connection to the device. Is the Ethernet cable connected correctly? By help of the Ethernet Device Configuration program check if the IP settings of the device are correct.
0x8023000E	NETANA_TRANSPORT_ABORTED	transfer was canceled due to keep-alive timeout or separation of the interface	The device is no longer accessible over the network connection.	Check the network connection to the device. Is the Ethernet cable connected correctly? By help of the Ethernet Device Configuration program check if the IP settings of the device are correct.
0x8023000F	NETANA_TRANSPORT_INVALID_RESPONSE	The packet was rejected Reply	The response packet was rejected due to invalid packet data.	Check if the first two digits of the version information of "Version Marshaller Client" and "Version Marshaller Server" are the same. If they are different perform an update of the hardware and the driver to the newest version.
Transport Header State Errors (only forNANL-B500G-RE)				
0x80230025	NETANA_TRANSPORT_UNSUPPORTED_FUNCTION	Function is not supported	The function request is incompatible or unsupported.	Check if the first two digits of the version information of "Version Marshaller Client" and "Version Marshaller Server" are the same. If they are different perform an update of the hardware and the driver to the newest version.
0x80230026	NETANA_TRANSPORT_TIMEOUT	Timeout when transmitting	The device is no longer accessible over the network connection.	Check the network connection to the device. Is the Ethernet cable connected correctly? By help of the Ethernet Device Configuration program check if the IP settings of the device are correct.
Marshaller Target Errors (for NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE)				
0xC0230001	NETANA_CAPTURE_ERROR_ON_TARGET	Capturing error on the target device	The data load of the capturing is too high.	Check if the PC works with 1 Gb/s. The LINK-1000/LINK100-LED (reverse side of the device) must light up green. Or reduce the load of the data to be captured, e.g. by the use of hardware filters (see section 8.6 on page 91).

Value	Error Code (Definition)	Description	Possible Causes	Troubleshooting
Capturing Errors (for NANL-C500-RE, NANL-B500E-RE and NANL-B500G-RE)				
0xC0660004	NETANA_CAPTURE_ERROR_NO_DMACHANNEL	No free DMA channel available. Probably host is too slow	The data load of the capturing is too high.	Check whether the hard disk of the PC is fast enough to save the captured data. The theoretical maximum load is 50 MB/s. Reduce the load of the data to be captured, e.g. by the use of hardware filters (see section <i>Filter Settings for the Hardware Filters</i> on page 91).
0xC0660005	NETANA_CAPTURE_ERROR_URX_OVERFLOW	XC buffer overflow (URX overflow)	Occurs because a non IEEE802.3 conform traffic is captured (e.g. too short frames, too small IFG).	Record only IEEE802.3-compliant message traffic.
0xC066000B	NETANA_CAPTURE_ERROR_NO_HOSTBUFFER	No free DMA buffer available.	Host is too slow to handle data efficiently.	Check whether the hard disk of the PC is fast enough to save the captured data. The theoretical maximum load is 50 MB/s. Reduce the load of the data to be captured, e.g. by the use of hardware filters (see section <i>Filter Settings for the Hardware Filters</i> on page 91).
0xC066000C	NETANA_CAPTURE_ERROR_NO_INTRAMBUFFER	Internal capture buffer overflow	No free INTRAM Firmware is out of memory resources and is unable to buffer more data. This may also be caused by a slow file system or a slow application	Check whether the hard disk of the PC is fast enough to save the captured data. The theoretical maximum load is 50 MB/s. Reduce the load of the data to be captured, e.g. by the use of hardware filters (see section <i>Filter Settings for the Hardware Filters</i> on page 91).
0xC066000D	NETANA_CAPTURE_ERROR_FIFO_FULL	Firmware is out of FIFO resources and is unable to buffer more data.	This may also be caused by a slow file system or a slow application	Optimize your application or use a faster PC.
0xC0770000	NETANA_CAPTURE_ERROR_DRIVER_FILE_FULL	End of capture file reached. Driver has stopped capturing.	The error is triggered when the ringbuffer mode is not activated and the end of capture file is reached.	No error

Table 48: Important Error Codes, possible Causes and Troubleshooting

11 LEDs

11.1 LEDs NANL-C500-RE and NANL-B500E-RE

LED	Color	State	Meaning
SYS	 green	On	Operating System running
	 yellow	Flashing cyclic at 1Hz	Device indicates boot error
	 yellow	On	Bootloader is waiting for booting procedure or device is deinitialized
	 off	Off	Power supply for the device is missing or hardware defect
STA0	 green	On	Capturing process active
	 red	On	Capturing process inactive
STA1	 green	Single Flash / On	Activity by signals on the GPIO (external input/output)
	 red	On	Error between PCI device and firmware to the PC
LINK / RJ45 Ch0 to Ch3	 green	On	A connection to the Ethernet exists
	 off	Off	The device has no connection to the Ethernet
RX / RJ45 Ch0 to Ch3	 yellow	Flashing / On	The device sends/receives Ethernet frames

Table 49: LEDs NANL-C500-RE and NANL-B500E-RE

Fatal Error

LED	Color	State	Meaning
SYS	 yellow	On	Fatal Error: Firmware is not able to start because of an hardware problem.
STA0	 red	On	
STA1	 red	On	

Table 50: LEDs NANL-C500-RE and NANL-B500E-RE – Fatal Error

Indicator States

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash followed by an off phase. The interval period for the flash when triggering a GPIO event is 100 ms.

Table 51: Indicator States

11.2 LEDs NANL-B500G-RE

11.2.1 SYS, STA0, STA1, IO, LINK und RX (Front Side)

LED	Color	State	Meaning
Front side NANL-B500G-RE			
SYS	 green	On	Operating System running
	 yellow	Flashing cyclic at 1Hz	Device indicates boot error
	 yellow	On	Bootloader is waiting for booting procedure or device is deinitialized
	 off	Off	Power supply for the device is missing or hardware defect
STA0	 green	On	Capturing process active
	 red	On	Capturing process inactive
STA1	 green	Single Flash / On	Activity by signals on the GPIO (external input/output)
	 red	On	Error between PCI device and firmware to the PC
The IO Status LED shows the configuration state of the GPIOs.			
IO	 green	On	The +3.3V input is enabled. Externally attached hardware will not be damaged, but make sure that voltage level matches to get proper signal detection.
	 red	On	The +24V output is enabled. Notice: Externally attached hardware could be damaged as voltage is driven.
	 orange	On	The +3.3V output is enabled. Notice: Externally attached hardware could be damaged as voltage is driven.
	 off	Off	The +24V input is enabled. Externally attached hardware will not be damaged, but make sure that voltage level matches to get proper signal detection.
Front side NANL-B500G-RE - RJ45 Ethernet Socket Ch0 and Ch1, TAP A and TAP B			
LINK / RJ45 Ch0 to Ch3	 green	On	A connection to the Ethernet exists
	 off	Off	The device has no connection to the Ethernet
RX / RJ45 Ch0 to Ch3	 yellow	Flashing / On	The device sends/receives Ethernet frames

Table 52: LEDs NANL-B500G-RE (Front Side)

Indicator States

Indicator state	Definition
On	The indicator is constantly on.
Off	The indicator is constantly off.
Blinking	The indicator turns on and off phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single Flash	The indicator shows one short flash followed by an off phase. The interval period for the flash when triggering a GPIO event is 100 ms.

Table 53: Indicator States

11.2.2 Fatal Error

LED	Color	State	Meaning
SYS	 yellow	On	Fatal Error: Firmware is not able to start because of an hardware problem.
STA0	 red	On	
STA1	 red	On	

Table 54: LEDs NANL-B500G-RE (Front Side) - Fatal Error

11.2.3 LINK-ACT and LINK-1000/LINK100 (Reverse Side)

From the LEDs on the Gigabit RJ45 Ethernet socket on the reverse side of the analyzer device NANL-B500G-RE you can see whether the recorded data are transmitted secure from loss to the PC.



Important! The color of both LEDs must be green! If the right LED lights up in orange, the transmission rate to the PC is less than 1 Gb/s, by consequence insufficient bandwidth may occur.

LED	Color	State	Meaning
Reverse Side NANL-B500G-RE - Gigabit Ethernet RJ45 Socket to the PC (1 Port with 1 Gb/s)			
LED at the left Side			
LINK-ACT / RJ45 Ch0	 green	On	From the NANL-B500G-RE device to the PC an Ethernet connection is established.
	 green	Blinking (12 Hz)	Ethernet data are transmitted from the NANL-B500G-RE device to the PC.
	 off	Off	There is no Ethernet connection between the NANL-B500G-RE device and PC.
LED at the right Side			
LINK-1000 / RJ45 Ch0	 green	On	The Ethernet data of the NANL-B500G-RE device are transferred to the PC with a transmission rate of 1000 bits/s (1 GB/s). Note: Only at a data transfer rate of 1 GB/s, the recorded data can be transmitted secure from loss to the PC on.
LINK-100 / RJ45 Ch0	 orange	On	The Ethernet data of the NANL-B500G-RE device are transferred to the PC with a transmission rate of 100 bits/s. Note: If the LED at the right side lights orange during the analyzer device NANL-B500G-RE records large amounts of data, in the device a buffer overflow happens. There is no transmission to the PC and the data recording is stopped.
LINK-1000 / LINK-100 / RJ45 Ch0	 off	Off	There is no transmission of the Ethernet data of the NANL-B500G-RE device to the PC.

Table 55: LEDs NANL-B500G-RE (Reverse Side)

12 Connections and Interfaces

12.1 Power Supply NANL-B500E-RE

The analyzer device NANL-B500E-RE can be operated by a DC power supply from 18V to 30V. The connector for the power supply are on the reverse side of the analyzer device. The power consumption is 4.3 W.

The polarity of the power plug has to be considered. No alternating (AC) power supply can be used, because the board is not designed for this type of power supply. The current consumption of the analyzer device NANL-B500E-RE depends on different factors, for example the operating mode of the netX, CPU load and mainly from the level of the real input voltage (the higher the voltage the lower the current).

Connector 24V Voltage Supply

NOTICE

Device Destruction!

Connect only one 24 V DC power supply to the device.

Combicon: 0V/+24V/PE:

Voltage supply 24V DC, $\pm 6V$,

Pin 1 = GND; Pin 2 = +24V; Pin 3 = PE

Pin	Description
1	Ground
2	18-30 V DC
3	PE

Maximum permitted cable length: 3 m

Alternatively Female Connector +24 V

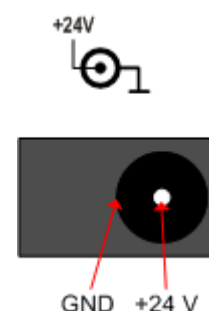
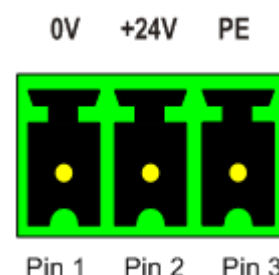
(only alternative use permitted!):

Voltage supply 24V DC, $\pm 6V$

max. 0.5 A, External = GND, Pin = +24V;

for barrel plug: ($\varnothing$ 3,0 / $\varnothing$ 1,1), L = 8,5 mm;

Maximum permitted cable length: 3 m



The female connector +24 V fits for the power supply: **TR15RA240-Power**.

Technical Data of TR15RA240-Power with barrel plug

Input: 90-264 VAC $\sim$ 0.4 A (47-63 Hz)

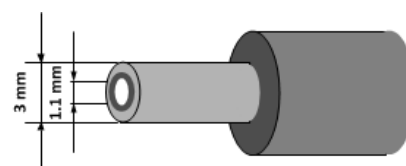
Output: 24 V / 0,625 mA

cable length: 1.8 m

Operating temperature range: 0 ... 60 ° C
(from 40 ° C, the current decreases with increasing temperature)

Order number: TR15RA240-331A03

Manufacturer: Cinon Electronics Ltd.



12.2 Power Supply NANL-B500G-RE

The analyzer device NANL-B500G-RE can be operated by a DC power supply from 18V to 30V. The connector for the power supply are on the reverse side of the analyzer device. The power consumption is 31.2 W.

The polarity of the power plug has to be considered. No alternating (AC) power supply can be used, because the board is not designed for this type of power supply. The current consumption of the analyzer device NANL-B500G-RE depends on different factors, for example the operating mode of the netX, CPU load, the load at the outputs and mainly from the level of the real input voltage (the higher the voltage the lower the current).

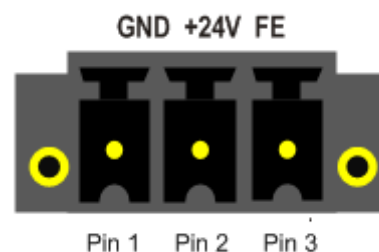
Connector 24V Voltage Supply

Combicon: 0V/+24V/PE:

Voltage supply 24V DC, $\pm 6V$,
Pin 1 = GND; Pin 2 = +24V; Pin 3 = FE

Pin	Description
1	Ground
2	18-30 V DC
3	FE

Maximum permitted cable length: 3 m

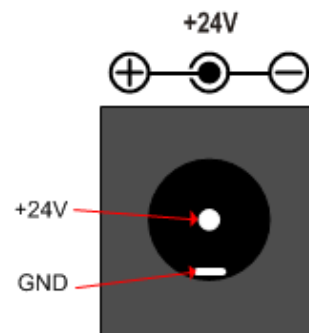


Alternatively Female Connector +24 V

(only alternative use permitted!):

Voltage supply 24V DC, $\pm 6V$
max. 3A, External = GND, Pin = +24V;
for barrel plug: ($\varnothing$ 5,5 / $\varnothing$ 2,1), L = 12 mm;

Maximum permitted cable length: 3 m



The female connector +24 V is fitting for the power supply: **TR30RA240-Power**.

Technical Data of TR30RA240-Power

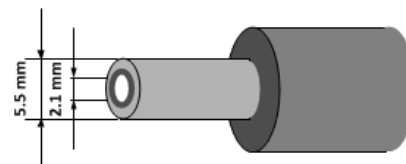
with barrel plug

Input:

90-264 VAC $\sim$ 0.4 ... 0.8 A (47-63 Hz)

Output: 24 V / 1.25 A

cable length: 1.8 m



Order number:

TRG30RA240V-11E03-BE-BK

Manufacturer: Cinon Electronics Ltd.

12.3 Ethernet Interface

For the Ethernet interface use RJ45 plugs and twisted pair cable of category 5 (CAT5) or higher, which consists of 4 twisted cores and has a maximum transmission rate of 100 MBit/s (CAT5).

12.3.1 Ethernet pinning at the RJ45 Socket

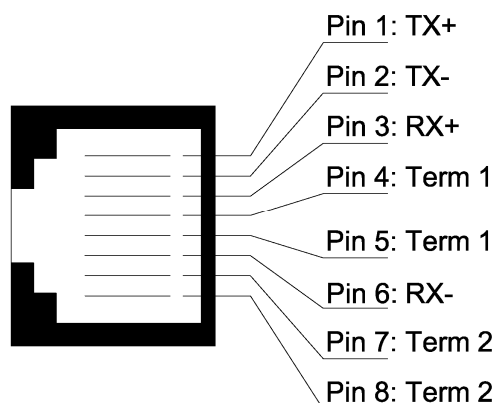


Figure 95: Ethernet pinning at the RJ45 Socket

Pin	Signal	Meaning
1	TX+	Transmit Data +
2	TX–	Transmit Data –
3	RX+	Receive Data +
4	Term 1	Connected to each other and terminated to PE through RC circuit*
5	Term 1	
6	RX–	Receive Data –
7	Term 2	Connected to each other and terminated to PE through RC circuit*
8	Term 2	
		* Bob Smith Termination

Table 56: Ethernet pinning at the RJ45 Socket



Note: The RJ45 socket is only for use in LAN, not for telecommunication circuits.

12.3.2 Data of the Ethernet Connection

Medium	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s)
Length of cable	max. 100 m
Reception Rate	10 MBit/s / 100 MBit/s

Table 57: Data of the Ethernet Connection

12.4 External IO Interface

The external IO interface has 4 digital inputs or outputs, the GPIOs 0 to 3. Each GPIO can be configured as input or output.

NOTICE

Device Destruction!

- At the I/O signal pins of the External IO interface of the NANL-C500-RE card or of the NANL-B500E-RE device use exclusively 3.3 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-C500-RE card or to the NANL-B500E-RE device!
- At the I/O signal pins of the External IO interface use exclusively 3.3 V or 24 V signaling voltage. Higher signaling voltage may lead to severe damage to the NANL-B500G-RE device!
- To operate the NANL-C500-RE card or the NANL-B500E-RE device use maximally 10 mA output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.
- To operate the the NANL-B500G-RE device use maximally 1 mA (bei 3,3V) or 600 mA (bei 24V) output current at the external IO interface I/O signal pins. Otherwise the netX chip and other components may be damaged.

Male connector external IO interface with GPIOs 0 to 3:

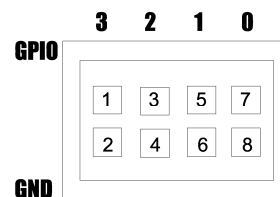


Figure 96: Male Connector external IO Interface

Pin	Signal	Pin	Signal
2	GND	1	3
4	GND	3	2
6	GND	5	1
8	GND	7	0

Table 58: Pin out external IO Interface

12.4.1 Connection Cable for external IO Interface

To access the digital signals of the GPIOs 0 to 3 of the external IO interface, you must use a cable that complies with the following requirements.

Parameter	Requirement
Min. conductor cross section	0,2 mm ²
Max. conductor cross section	1 mm ²
Max. cable length	5 m
Shielding	Shielded cables

Table 59: Requirements for the Connection Cable for external IO Interface

13 Technical Data



Note: All technical data are temporarily and can be altered without notice.

13.1 Analyzer Card NANL-C500-RE

NANL-C500-RE	Parameter	Value
Part	Name	NANL-C500-RE
	Part No.	7.310.100
	Description	netANALYZER PC card with PCI Interface for Real-Time Ethernet and all 100BASE-T Ethernet Networks
	Function	Passive Ethernet analyzer for Real-time Ethernet systems; analyzes data traffic in a communication link and logs the incoming Ethernet frames. In addition, events of four digital inputs can be recorded.
Communication Controller	Type	netX 500 processor with ARM 926 CPU
Integrated Memory	Size of the Dual-Port Memory	64 KByte
System Interface	Bus Type	PCI V2.3
	Transmission Rate	33 MHz
	Data Access	DPM and DMA (Direct Memory Access)
	Width for the data access to the Dual-Port Memory (DPM)	32-Bit
	Data Throughput PCI Bus	Tested to 35 MB/s
Ethernet Communication	Ethernet Communication	Receipt of Ethernet frames
	Ethernet Frame Types	Ethernet II
Ethernet Interface	Transmission rate	10 MBit/s, 100 MBit/s
	Interface Type	100 BASE-TX, 10 BASE-T
	Galvanic Isolation	isolated
	Half duplex/Full duplex	supported
	Connector	2* RJ45 Socket, refer also to section <i>Ethernet Interface</i> on page 145.
	Ethernet cable	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s), Length of cable max. 100 m
	Channels / Ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)
	Filter	2 Filter on the first 512 Bytes of the Ethernet Frames (Source and Destination MAC Address, Ether-Type and 498 following Bytes)
	Time Stamp Resolution	10 ns
External IO Interface	External Interface Input Signals/Output Signals (female connector X40):	4 x digital Inputs/Outputs (GPIOs 0 to 3), 3.3 V / 10mA (refer to section <i>Maximum permissible Output Current (external IO Interface)</i> on page 27); Minimum distance for GPIO events > 150 µs

NANL-C500-RE	Parameter	Value
Display	LED Display	SYS System Status STA 0 Capturing active / inactive STA 1 Event signal detected LED yellow Ethernet RX status (each at RJ45Ch0 and RJ45Ch1) LED green Ethernet Link status Refer to chapter <i>LEDs</i> , page 140.
Power supply	Supply Voltage	+3,3 V dc $\pm 5\%$, refer to section <i>Power Supply and Host Interface</i> on page 26.
	Maximum Current at 3,3 V (typically)	800 mA
	Connector	Via PCI Bus
Environmental Conditions	Operating temperature range*	0 °C ... +55 °C
	*Air flow during measurment	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 ... 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	137 x 107 x 17,5 mm
	Mounting/Installation	PCI slot (5 V or 3.3 V)
	RoHS	Yes
Analyzer Software	netANALYZER Software* (provided)	Graphical user software for Windows for data capturing as well as for timing and network load analysis
	* Data Format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 60: Technical Data Analyzer Card NANL-C500-RE

13.2 Analyzer Device NANL-B500E-RE

NANL-B500E-RE	Parameter	Value
Part	Name	NANL-B500E-RE
	Part No.	7.311.100
	Description	netANALYZER portable Device with ExpressCard Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks (Stand-alone Device),
	Function	Passive Ethernet analyzer for RT-Ethernet systems; analyzes the data in a communication link and captures the incoming Ethernet frames. Additionally, events of four digital inputs can be captured.
Communication Controller	Type	netX 500 processor with ARM 926 CPU
Integrated Memory	Size of the Dual-Port Memory	64 KByte
System Interface	Bus Type	ExpressCard 34, PCI Express Base Specification Revision 2.0 and PCI Express to PCI/PCI-X Bridge Specification Revision 1.0
	Data Throughput PCI Bus	Tested to 35 MB/s
Ethernet Communication	Ethernet Communication	Receipt of Ethernet frames
	Ethernet Frame Types	Ethernet II
Ethernet Interface	Transmission rate	10 MBit/s, 100 MBit/s
	Interface Type	100 BASE-TX, 10 BASE-T
	Galvanic Isolation	isolated
	Half duplex/Full duplex	supported
	Connector	2* RJ45 Socket, refer also to section <i>Ethernet Interface</i> on page 145.
	Ethernet cable	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s), Length of cable max. 100 m
	Channels / Ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)
	Filter	2 Filter on the first 512 Bytes of the Ethernet Frames (Source and Destination MAC Address, Ether-Type and 498 following Bytes)
	Time Stamp Resolution	10 ns
Diagnosis Interface	USB Plug	Mini B USB Plug (5-pin) (<i>for future use only</i>)
External IO Interface	External Interface Input Signals/Output Signals (female connector X40):	4 x digital Inputs/Outputs (GPIOs 0 to 3), 3.3 V / 10mA (refer to section <i>Maximum permissible Output Current (external IO Interface)</i> on page 27); Minimum distance for GPIO events > 150 µs

NANL-B500E-RE	Parameter	Value
Display	LED Display	SYS System Status STA 0 Capturing active / inactive STA 1 Event signal detected LED yellow Ethernet RX status (each at RJ45Ch0 and RJ45Ch1) LED green Ethernet Link status Refer to chapter <i>LEDs</i> , page 140.
Power supply	Supply Voltage nominal	24V DC / 180 mA / 4,3 W (refer to sections <i>Power Supply and Host Interface</i> on page 26 and <i>Power Supply NANL-B500E-RE</i> on page 143)
	Range	18V ... 30V DC
	Connector 24V Voltage Supply	<u>Combicon 0V/+24V/PE</u> : Voltage supply 24V DC, $\pm 6V$, Pin 1 = GND; Pin 2 = +24V; Pin 3 = PE; Maximum permitted cable length: 3 m Alternatively <u>Female Connector +24 V</u> (only alternative use permitted!): Voltage supply 24V DC, $\pm 6V$ max. 0.5 A, External = GND, Pin = +24V; for barrel plug: ($\varnothing$ 3,0 / $\varnothing$ 1,1), L = 8,5 mm; Maximum permitted cable length: 3 m
Operation	SD	Micro SD Card Slot (for future use only)
	Switch	RUN / STOP / RESET (for future use only)
Environmental Conditions	Operating temperature range*	0 °C ... +55 °C
	*Air flow during measurment	0,5m/s
	Storage temperature range	0 °C ... +70 °C
	Humidity	10 ... 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	115 x 62 x 133 mm
	Mounting/Installation	PCI Express Slot for notebook (ExpressCard), (PCIe compatible)
	RoHS	Yes
Analyzer Software	netANALYZER Software* (provided)	Graphical user software for Windows for data capturing as well as for timing and network load analysis
	* Data Format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 61: Technical Data Analyzer Device NANL-B500E-RE

13.3 Analyzer Device NANL-B500G-RE

NANL-B500G-RE	Parameter	Value
Part	Name	NANL-B500G-RE
	Part No.	7.313.100
	Description	netANALYZER portable Device with Gigabit Ethernet PC Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks (Stand-alone Device).
	Function	Passive Ethernet analyzer for RT-Ethernet systems; analyzes the data in a communication link and captures the incoming Ethernet frames. Additionally, events of four digital inputs can be captured.
Communication Controller	Type	netX 500 processor with ARM 926 CPU
Integrated Memory	Size of the Dual-Port Memory	64 KByte
System Interface	PC Interface	Gigabit Ethernet RJ45 Socket to the PC
	Required Connector (at the reverse side of the device)	,UPLINK 1Gb/s': Ethernet RJ45 Socket (1 Port)
	Data Throughput PCI Bus	Tested to 35 MB/s
Ethernet Communication	Ethernet Communication	Receipt of Ethernet frames
	Ethernet Frame Types	Ethernet II
Ethernet Interface	Transmission rate	10 MBit/s, 100 MBit/s
	Interface Type	100 BASE-TX, 10 BASE-T
	Galvanic Isolation	isolated
	Half duplex/Full duplex	supported
	Connector	2* RJ45 Socket, refer also to section <i>Ethernet Interface</i> on page 145.
	Ethernet cable	2 x 2 Twisted-Pair cupric cable, CAT5 (100 MBit/s), Length of cable max. 100 m
	Channels / Ports	2 communication channels with integrated TAP (TAP B, TAP A), and each with two ports for capturing data in both directions (together 4 Ports: Port 0 to Port 3)
	Filter	2 Filter on the first 512 Bytes of the Ethernet Frames (Source and Destination MAC Address, Ether-Type and 498 following Bytes)
	Time Stamp Resolution	10 ns
Diagnosis Interface	USB Interface	USB Plug (Typ A, 4-pin) (<i>for future use only</i>)
External IO Interface	External Interface Input Signals/Output Signals (female connector):	4 digital Inputs/Outputs (GPIOs 0 to 3), 3.3 V / 1 mA or 24V / 600 mA (refer to section <i>Maximum permissible Output Current (external IO Interface)</i> on page 27); Minimum distance for GPIO events > 150 µs

NANL-B500G-RE	Parameter	Value
Display	LED Display (at the front side of the devices)	SYS System Status STA 0 Capturing active / inactive STA 1 Event signal detected IO Indicates the GPIO status (3.3V input, 24V input, 3,3V output, 24V output) LED yellow Ethernet RX status (each at RJ45Ch0 and RJ45Ch1) LED geen Ethernet Link status Refer to chapter <i>LEDs</i> , page 140.
	LED Display (at the reverse side of the devices) Indicaed whether the recorded data are transmitted secure from loss to the PC.	LED green/orange Ethernet LINK 1000 (to Gigabit Ethernet RJ45 socket) LINK 100 status LED green Ethernet LINK ACT status Refer to chapter <i>LEDs</i> , page 140.
Power supply	Supply Voltage nominal	224V DC / 700 mA / 16.8 W (refer to sections <i>Power Supply and Host Interface</i> on page 26 and <i>Power Supply NANL-B500G-RE</i> on page 144)
	Range	18V ... 30V DC
	Connector 24V Voltage Supply	<u>Combicon 0V/+24V/FE</u> : Voltage supply 24V DC, $\pm 6V$, Pin 1 = GND; Pin 2 = +24V; Pin 3 = FE; Maximum permitted cable length: 3 m Alternatively <u>Female Connector +24 V</u> : Voltage supply 24V DC, $\pm 6V$ max. 3 A, External = GND, Pin = +24V; for barrel plug: ($\varnothing$ 5,5 / $\varnothing$ 2,1) L = 12 mm; Maximum permitted cable length: 3 m
	Power Switch	ON / OFF
Operation	REC Button	Enables data recording* (and reset to DHCP server operation mode) (for future use only)
Environmental Conditions	Operating temperature range*	- 20 °C ... +55 °C
	*Air flow during measurment	0,5m/s
	Storage temperature range	-10 °C ... +70 °C
	Humidity	10 ... 95% relative humidity, no condensation permitted
	Environment	The device must be used in a pollution degree 2 environment.
Device	Dimensions (L x W x H)	115 x 62 x 173 mm
	Mounting/Installation	-
	RoHS	Yes
Analyzer Software	netANALYZER Software* (provided)	Graphical user software for Windows for data capturing as well as for timing and network load analysis Note: The analyzer device NANL-B500G-RE is only supported by the netANALYZER software beginning from version 1.5.x.x.
	* Data Format	Open WinPcap data format
	Network monitoring program Open Source Wireshark (recommended)	To display the recorded analysis data of the Ethernet frames (supports WinPcap format)

Table 62: Technical Data Analyzer Device NANL-B500G-RE

14 Annex

14.1 Hardware Update for NXANL 500-RE Rev 2 and Rev 3

For existing installation of the analyzer cards NXANL 500-RE of the hardware revisions 2 and 3 you must apply the netANALYZER hardware update „Update NXANL 500-RE Revision 3“ and then update the netANALYZER driver and the netANALYZER software.

Therefore proceed as described below:

1. Burn an ISO image of the netANALYZER Hardware Update on a CD.
 - Burn the file *Update NXANL 500-RE Revision 3\netANALYZER_hw_update.iso* from the netANALYZER installation DVD as ISO image on a CD.
2. Boot the PC with the existing hardware installation.
3. Put the CD with the ISO image of the netANALYZER hardware update into the DVD-ROM drive of this PC.
 - The system of the PC boots and after a short time the following text is displayed at the screen:

```
-----  
This is an update CD for netANALYZER Rev 2 an Rev 3 card which do not work  
under Windows Vista and Windows 7.  
  
This happens due to an invalid subvendor ID provided by the cards on the PCI  
bus. Please call "netanalyzer-update" to start the update procedure.  
-----  
user@netANALYZER-update: ~$
```

4. Start the Hardware Update.
 - Therefore enter `netanalyzer-updater`.

```
user@netANALYZER-update: ~$netanalyzer-updater
```

- Press **Enter**.
- The hardware update utility searches for Hilscher devices and then for netANALYZER portable Device.

➤ The following text is displayed at the screen:

```
Initializing drivers: Done
Search Hilscher Devices: Done
Found Hilscher Devices
-----
Bus| Dev |Func | Phys Addr. | Vendor | Device | SubVendor | SubDevice | DevClass
[Values of the device list]
-----
Do you want to continue with the update? (y/n)
```

5. Continue the Hardware Update.

➤ Therefore enter **y**.

```
Do you want to continue with the update? (y/n)y
```

➤ Press **Enter**.

➤ The following text is displayed at the screen:

```
Please reboot your computer now, to activate the changes!
user@netANALYZER-update: ~$
```

6. Reboot the PC with the existing hardware installation.

➤ The hardware update is finished.

7. Now actualize the netANALYZER driver and the netANALYZER software, as described under section *How to install the netANALYZER Driver and Software* from page 40 on.

14.2 Hints on how to install the netANALYZER Driver manually

The netANALYZER / netSCOPE Device Driver can be installed manually via MSI File.

Note: If for the netANALYZER Driver Installation the netANALYZER Driver x[*bit version*].msi file is activated via double click and the bit version („x86“ = 32-bit, „x64“ = 64-bit) of the activated file is incompatible to the system requirements, the Windows Installer error message will be displayed with the note, that the installation package is not supported by this processor type.



Figure 97: netANALYZER Driver manual Installation Error Message

- To install the netANALYZER Driver correctly, select the bit version of the netANALYZER Driver x[*bit version*].msi file, which is compatible to the system requirements.

14.3 Wireshark netANALYZER Plugin before Wireshark 1.7.1



Note: Wireshark versions beginning from V1.7.1 contain the netANALYZER code and the Wireshark netANALYZER plugin is no longer needed. For Wireshark versions before V1.7.1 the Wireshark netANALYZER plugin must be installed. The Wireshark netANALYZER plugin is usable from Wireshark version 1.0.2.

The Wireshark netANALYZER plugin allows to display the netANALYZER port number (the number of the port of the netANALYZER hardware) and specific error information for each Ethernet telegram in Wireshark.

14.3.1 Uninstalling manually installed Plugin

Before installing the current plugin, the manually installed plugin of the netANALYZER versions 1.0-1.2 must be uninstalled manually. Also the 64-bit and the 32-bit Wireshark netANALYZER plugin are not compatible. Each of them must be uninstalled before the other plugin can be installed.



Note: The Wireshark netANALYZER plugin only can be uninstalled via *Start > Settings > Control Panel > Software > Add or Remove Programs > Currently installed programs > Remove* if the plugin was already installed automatically before, otherwise the plugin must be uninstalled manually.

Uninstalling the Plugin manually

- Therefore delete the file „netanalyzer.dll“ or „netanalyzer_x64.dll“ from the directory *“plugins” of the installed Wireshark software* and replace it by the new plugin file.

Or, if the plugin file with the first manual installation was stored to the *user directory under “Application data” in the subdirectory “Wireshark\plugins”*, the plugin file now must be deleted from this directory and must be replaced there by the current plugin file.

14.3.2 Installing netANALYZER Plugin via Setup

To install the netANALYZER plugin proceed as described hereafter:

1. Close all programs!
2. Enter the netANALYZER Installation DVD in the local DVD ROM drive.
3. Select **Install netANALYZER** in the autostart menu.



Note: Under Windows® you need administration rights for the installation!

4. In the **Install netANALYZER** dialog select the installation option **wire-shark Plugin (not required for Wireshark 1.7.1 and newer)**.

➤ The plugin installation is started.

- Then screen **Welcome to the netANALYZER Driver Setup Wizard** is displayed:

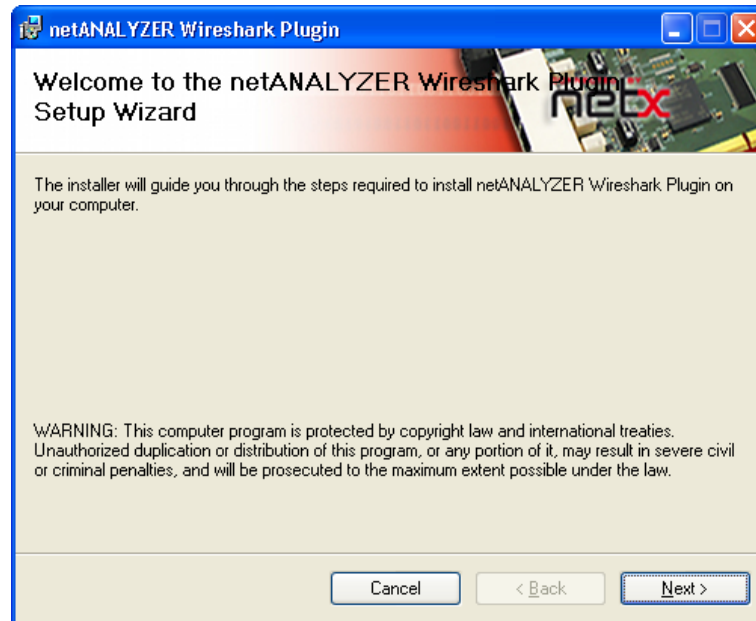


Figure 98: netANALYZER Wireshark Plugin Setup Wizard: The Installer guides you through the Setup.

- Click to **Next**.
- The screen **Select Installation Folder** is displayed:

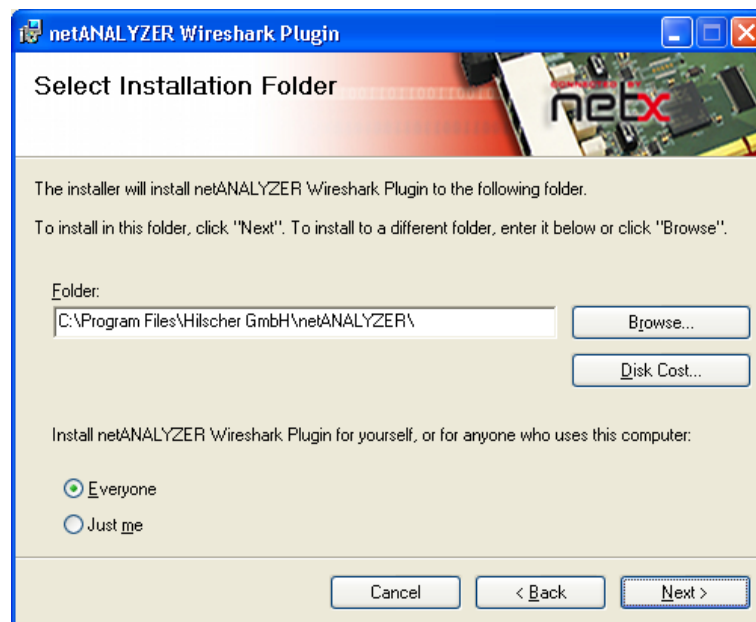


Figure 99: netANALYZER Wireshark Plugin Setup Wizard: Defining the Installation Directory and the User

- Under **Folder** define the installation folder.
- Possibly select via **Browser...** a different directory.
- Possibly check via **Disk Cost...** the free disk space.
- Define the user: **Everyone** or **Just me**.

➤ The screen **Confirm Installation** is displayed:

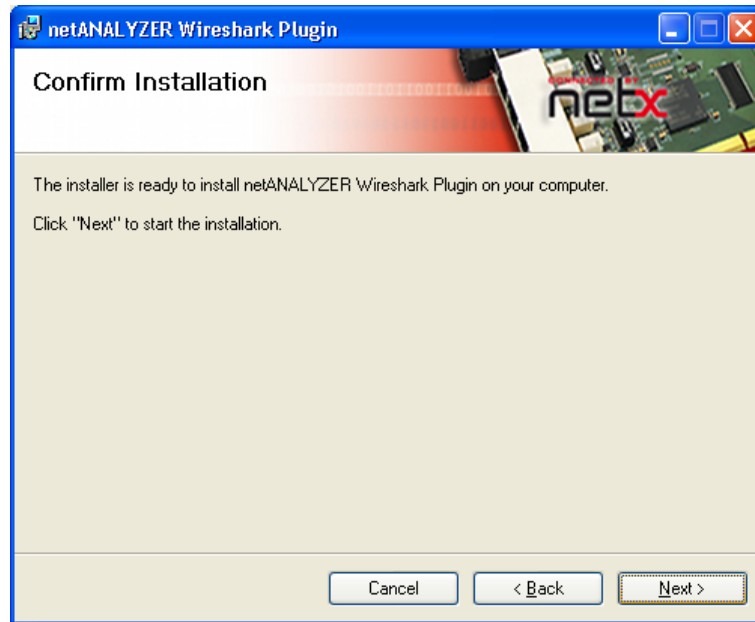


Figure 100: netANALYZER Wireshark Plugin Setup Wizard: Starting the netANALYZER Wireshark Plugin Installation

➤ Start the netANALYZER Wireshark Plugin Installation via **Next**.

➤ The screen **Installing netANALYZER** is displayed:

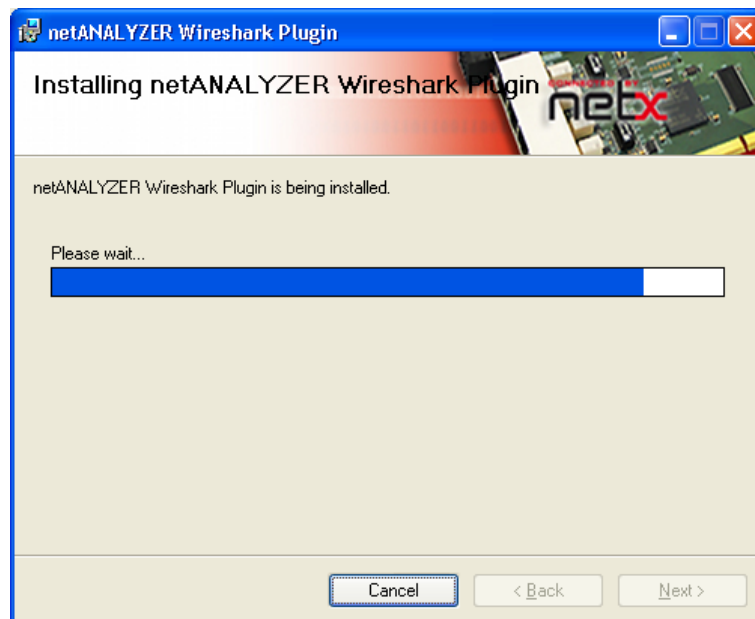


Figure 101: netANALYZER Wireshark Plugin Setup Wizard: netANALYZER Wireshark Plugin Installation

➤ The screen **Installation complete** is displayed:

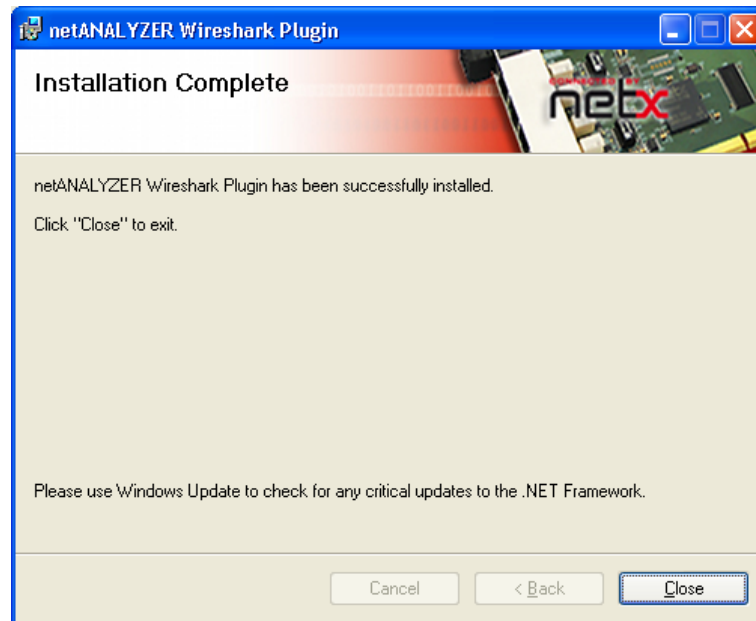


Figure 102: netANALYZER Wireshark Plugin Setup Wizard: Close the netANALYZER Wireshark Plugin Installation

- Close the netANALYZER Wireshark Plugin Installation via **Close**.
- The netANALYZER Wireshark Plugin Installation is complete.

14.3.3 Default Paths for the netANALYZER Plugin

With the installation via the netANALYZER setup the netANALYZER plugin is stored in the *user directory* under "*Application data*" in the subdirectory "*Wireshark\plugins*" (*C:\documents and Settings\[user name]\Application data\wireshark\plugins*). Depending from the Windows® version the "Application data" directory can have also the name "appdata".

14.3.4 Installing Plugin manually

- To install the plugin manually, copy from the directory "plugin" of the netANALYZER Installation DVD the file „netanalyzer.dll“ or „netanalyzer_x64.dll“ into the directory "*plugins*" of the installed Wireshark software or to the *user directory* under "*Application data*" in the subdirectory "*Wireshark\plugins*".
- Select the file „netanalyzer.dll“ if Wireshark works as 32-bit version.
- Select the file „netanalyzer_x64.dll“ if Wireshark works as 64-bit version.

The „plugins“ directory for Wireshark is located for Wireshark version 1.0.4. mostly under „*C:\Program files\Wireshark\plugins\1.0.4*“. For another Wireshark version the version number differs accordingly.

- After the netANALYZER plugin has been installed, it is activated automatically with the next start of the Wireshark program.

14.3.5 Checking netANALYZER Info Block

If the Wireshark netANALYZER plugin is installed correctly, additionally port and error information will be displayed for .pcap files, which contains a netANALYZER info block.

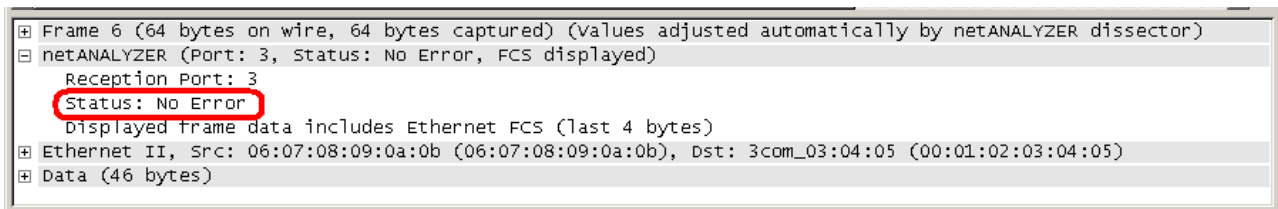


Figure 103: Wireshark: netANALYZER Info Block (Wireshark netANALYZER plugin was installed correctly): No Error

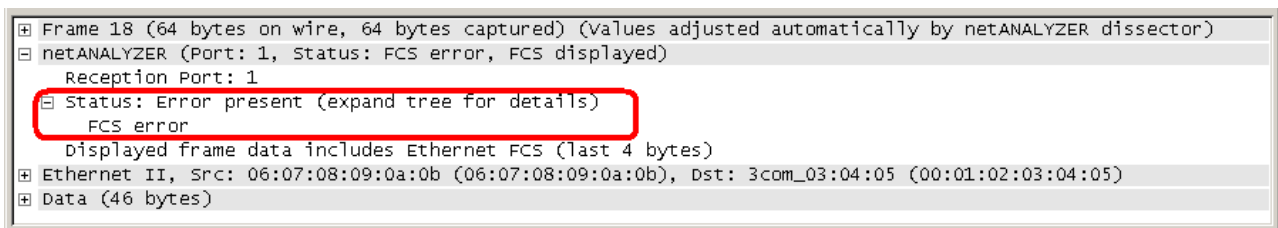


Figure 104: Wireshark: netANALYZER Info Block (Wireshark netANALYZER plugin was installed correctly): Error Messages with additional text information

Wireshark before V1.7.1: Plugin not or not correctly installed



Note: If a .pcap files contains a netANALYZER info block and the plugin is not or not correctly installed, then Wireshark can interpret the available additional information behind the Ethernet frame not correctly and will display telegram errors. In this case deactivate the generation of the info block or (better) install the netANALYZER plugin.

For wireshark versions before wireshark 1.7.1 the info block can be recognized by the label „netANALYZER frame info block“. Here the info block is behind the Ethernet frame.

0000	01 0e cf 00 01 02 00 b2 23 34 45 00 88 92 00 80	#4E....
0010	e7 90 3f 3b 00 00 00 00 00 06 21 38 04 89 00 00	..?;.....18....
0020	00 00 00 00 02 16 00 00 00 00 00 00 00 00 00 00	
0030	00 00 00 00 00 00 00 00 00 00 00 00 00 04 0a 00 00	
0040	00 00 00 09 38 44 4c 00 06 06 00 00 00 00 00 00 00	8DI.....
0050	08 06 00 00 00 00 00 00 00 00 db 00 00 01 6e 65	ne
0060	74 41 4e 41 4c 59 5a 45 52 20 66 72 61 6d 65 20	netANALYZER frame
0070	69 6e 66 6f 20 62 6c 6f 63 6b 01 00 00 00 00 00	info block.....

Figure 105: Wireshark before V1.7.1: netANALYZER Info Block without Plugin

14.4 Activating GPIO Dissector for Wireshark before V1.7.1

**Note:**

For Wireshark versions before V1.7.1 note: GPIO events of the analyzer card NANL-C500-RE or the analyzer device NANL-B500E-RE are decoded by Wireshark beginning with version 1.0.0. If after Wireshark installation the "Hilscher-netANALYZER GPIO event" is not displayed, the appropriate protocol must be activated in Wireshark once.

For Wireshark versions beginning from V1.7.1 on activating the Wireshark GPIO dissector is not required.

To activate GPIO Dissector for Wireshark before V1.7.1:

- Select in Wireshark **Edit > Preferences**.

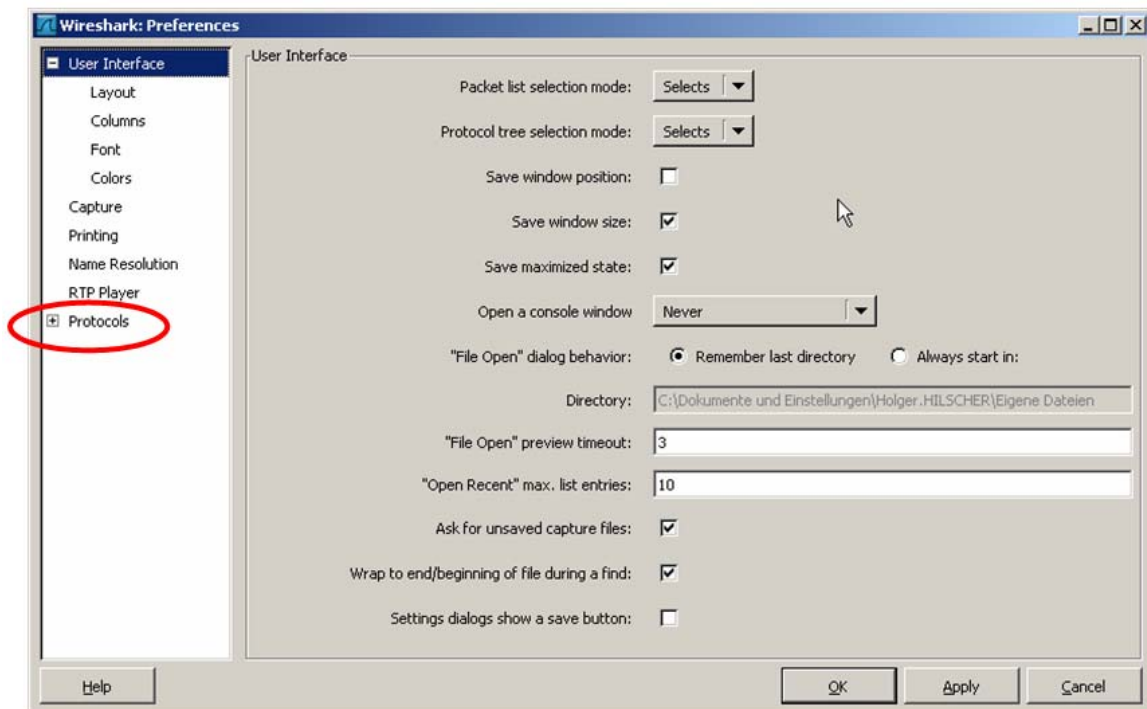


Figure 106: Wireshark: Preferences > Protocols

- Select in the **Preferences** dialog in the left column under **Protocols** „Hilscher“.
- Activate **Enable dissector**.

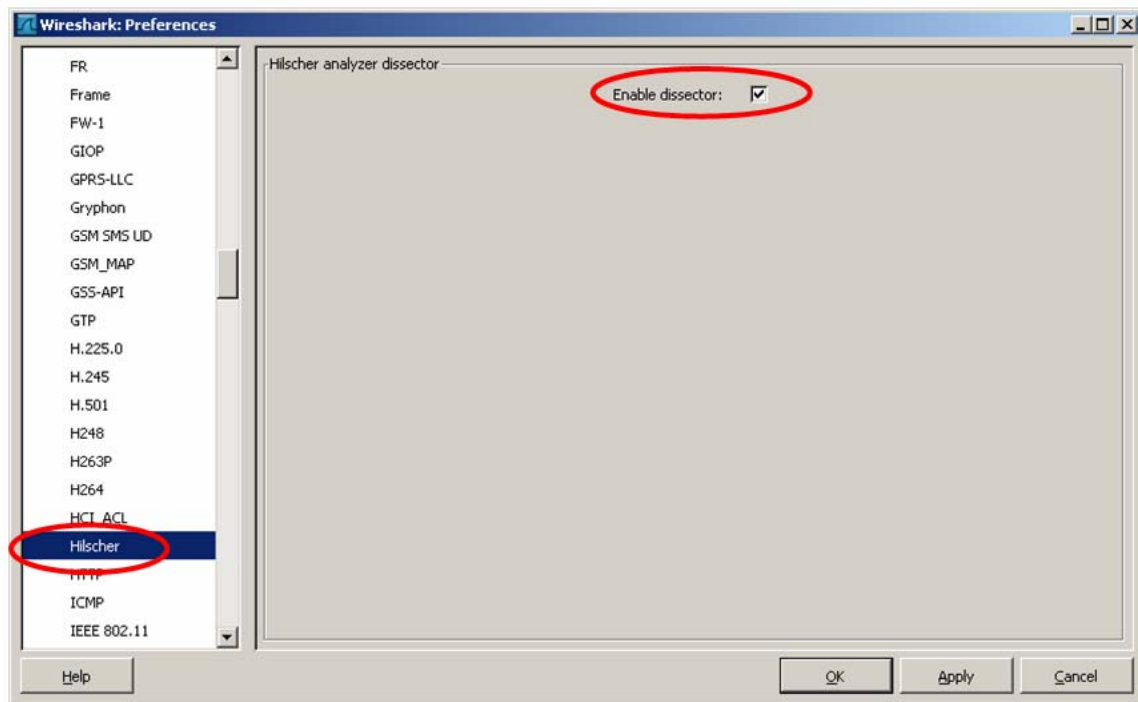


Figure 107: Wireshark: Preferences > ... Enable dissector

- In addition under **Analyze > Enable Protocols...** activate the protocol „Hilscher“.

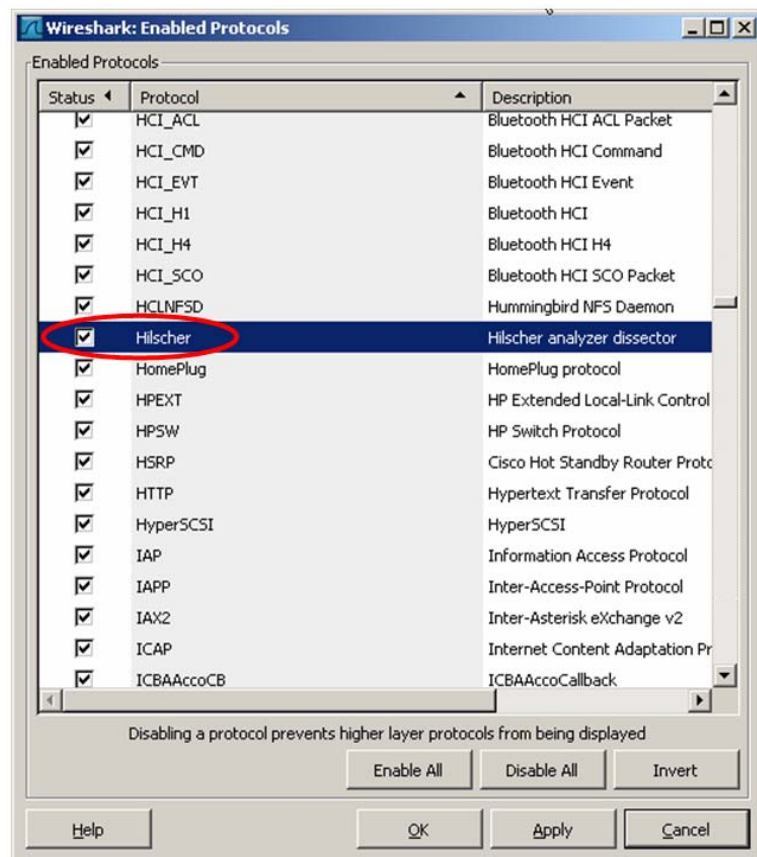


Figure 108: Wireshark: Enable Protocols

14.5 Wireshark: FCS Handoff

Many Wireshark plugins are not compatible with FCS handoff. To deactivate the FCS handoff:

- Select in Wireshark **Edit > Preferences**.
- Select in the **Preferences** dialog at the left side **Protocols > netANALYZER**.

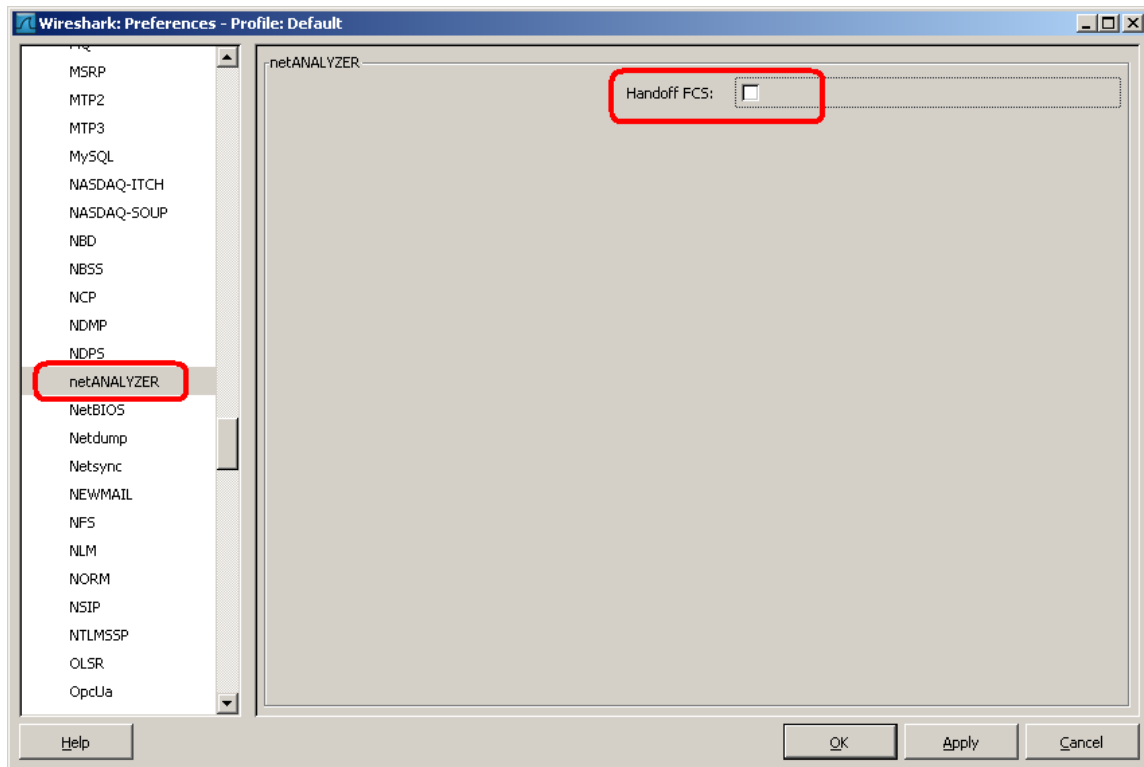


Figure 109: Wireshark: Preferences > Protocols > netANALYZER

- Uncheck **Handoff FCS**.
- Close the window via **OK**.
- The FCS checksum is excluded from the analysis.

14.6 Failure in 10 MBit/s Half Duplex Mode and Workaround



Important: The failure described here only affects older **NANL-C500-RE** devices with serial numbers up to **20233** and **NANL-B500E-RE** devices with serial numbers up to **20040**.

Affected Hardware

Hardware with the communication controller netX 50, netX 100 or netX 500; netX/Internal PHYs.

When can this Failure occur?

When using standard Ethernet communication with 10 MBit/s half duplex mode, the PHY gets stuck in case of network collisions. Then no further network communication is possible. Only device power cycling allows Ethernet communication again.

This problem can only occur with Ethernet TCP/UDP IP, EtherNet/IP or Modbus TCP protocols when using hubs at 10 MBit/s. The issue described above is not applicable for protocols which use 100 MBit/s or full duplex mode.

Solution / Workaround:

Do not use 10 MBit/s-only hubs. Use either switches or 10/100 MBit/s Dual Speed hubs, to make sure the netX Ethernet ports are connected with 100 MBit/s or in full duplex mode.

This erratum is fixed with all components of the 'Y' charge (9 digit charge number shows 'Y' at position 5 (nnnnYnnnn)).

Reference

"Summary of 10BT problem on EthernetPHY",
RenesasElectronics Europe, April 27, 2010

14.7 Disposal of Waste Electronic Equipment

According to the European Directive 2002/96/EG "Waste Electrical and Electronic Equipment (WEEE)", waste electronic equipment may not be disposed of as household waste. As a consumer, you are legally obliged to dispose of all waste electronic equipment according to national and local regulations.



Waste Electronic Equipment

- This product must not be treated as household waste.
- This product must be disposed of at a designated waste electronic equipment collecting point.

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14.10 Glossary

ASIC netX 500

Application Specific Integrated Circuit
Real-Time capable controller for short response times

CSV

Comma Separated Value

DHCP

Dynamic Host Configuration Protocol
This is a protocol simplifying the configuration of IP networks by automatically assigning IP addresses.

DMA

Direct Memory Access

DPM

Dual-Port Memory

FCS

Frame Check Sequence (Check sum at the frame end for error detection)

GPIO

General Purpose Input/Output

hea

File extension of the binary files with the capture information content (default.hea) created by the Hilscher **netANALYZER** software

NANL-C500-RE

netANALYZER PC Card with PCI Interface for Real-Time Ethernet and all 100BASE-T Ethernet Networks

NANL-B500E-RE

netANALYZER portable Device with ExpressCard Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks

NANL-B500G-RE

netANALYZER portable Device with Gigabit Ethernet PC Interface for Real-Time Ethernet and all 10/100BASE-T Ethernet Networks

netANALYZER

netANALYZER software (Windows® Application)

.NET Framework Version 2.0

Microsoft .NET Framework Version 2.0

<http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=16614>

nff

netANALYZER filter file

SFD

Start-of-Frame-Delimiter: Bits subsequent to the preamble at the start of an Ethernet telegram.

PHY

Physical Interface

TAP

Test Access Point

Wireshark

„Network Monitoring Program Wireshark“

<http://www.wireshark.org>

WinPcap

„The Library WinPcap“

<http://www.winpcap.org/>

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